X-Analysis Professional

TUTORIAL

Software Version: 9.8

This product requires a security code to activate it.
For Security Code, please call Databorough

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Welcome to this Tutorial

This tutorial is a handy, stepwise, illustrative guide especially designed to familiarize you with the superlative benefits of the X-Analysis product suite.

How this Tutorial is Organized?

The tutorial is in two parts. The first part (Chapters 1 & 2) introduces you to the sophisticated X-Analysis software. The second part (Chapters 3 to 6) comprises comprehensive details of the X-Analysis solution sets.

Chapter 1 Introduction

Get a glimpse of the benefits of using X-Analysis. The chapter outlines the hardware-related prerequisites for installing the advanced software.

Chapter 2 Getting Started With X-Analysis Client

Provides you simple delineation of steps to starting the initialization process for X-Analysis

Chapter 3 Analysis and Documentation

This chapter is in separate sections and sub-sections that explain the latest computing and documenting features of X-Analysis. The sections use actual screenshots of the respective windows and drop-down menus.

Chapter 4 Data Modeling

The chapter provides an in depth, pictorial overview of how Data Modeling helps to understand the application design, in purview of all possible relationships among files.

Chapter 5 Business Rules Analysis

This chapter comprises details of how X-Analysis creates application areas that, in turn, aid the Business Rules Analysis tool in isolating, indexing, and documenting the design elements.

Chapter 6 Metrics Analysis

This chapter gives you a systematic, theoretical, and visual description of the features and functions of X-Audit module meant for advanced computing purposes.

Chapter 7 What's Next

A look at exciting technological days ahead!

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Who Should Read This Tutorial

Software professionals - from analysts and developers to architects and operations teams - who intend to analyse, document, or modernize AS/400 IBM i applications - may read this tutorial. Explore this tutorial and gain insight into the inimitable facets of X-Analysis that equip users with rich understanding of existing legacy applications.

Acronyms Used in This Document

ACRONYM	MEANING
APD	Access Path Diagram
DFD	Data Flow Diagram
DMD	Data Model Diagram
FFD	File Field Details
SCD	Structure Chart Diagram

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Chapter 1: Introduction to X-Analysis

Get to know the most sophisticated and easiest-to-use analysis tool in this chapter. Learn about the tool's instant and automated features *viz*. impact analysis, cross-referencing, and graphical documentation of RPG and COBOL applications. Also, get updated on the hardware prerequisites needed for successful installation of the software.

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Benefits of X-Analysis

Databorough's X-Analysis product suite is an essential tool for IBM i application documentation, design recovery, and re-engineering. The X-Analysis software works as a plugin under IBM's RDi / RDp / WDSC and Eclipse, enabling users to browse and visualize applications from a high-level model down to individual lines of code. RPG & COBOL as pseudo code, variable level impact analysis, graphical flow/structure charts, graphical data flowcharts, PDF/MS Word and MS Visio documentation wizards, are just some of the features packed into this globally renowned tool.

X-Analysis allows technical analysts to navigate graphically through an IBM i application from a Windows PC. Working in a true client-server mode, X-Analysis automatically cross-references databases and ensures that the display is always up-to-date and is a true representation of the application on the IBM i.

Prerequisites*

Before starting this tutorial, the following are required:

- The X-Analysis server and the Client components should be installed to an IBM i server and a Windows PC respectively.
- The demo library - XAN4CDEM and its cross-reference library - XAN4CDXA should be successfully restored on the IBM i.

***For details on how to implement these prerequisites, please refer to the X-Analysis User Manual.**
Note: This tutorial only teaches the usage of the tool and not topics like Initialisation, Reengineering, etc

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Chapter 2: Getting Started with X-Analysis Client

The chapter gives you the sequence of steps to get started with the software. There are simple guidelines that accompany individual screenshots, making the activation process easy to understand.

The chapter contains:

- Take the first step - Open Perspective and select X-Analysis Perspective (page 8)
- Instructions to fill the X-Analysis Signon dialog, screenshot of the dialog box (pages 9 - 10)
- Expanded Application Library screenshot (page 11)

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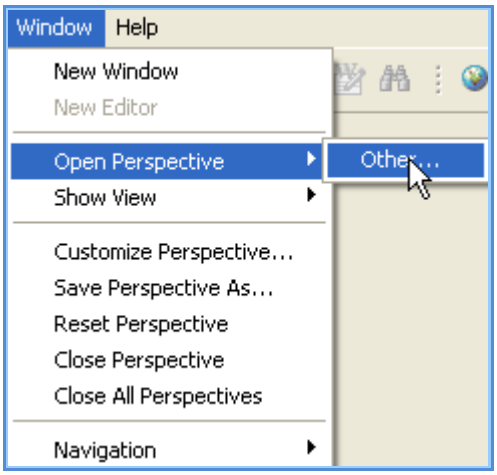
Take the first step

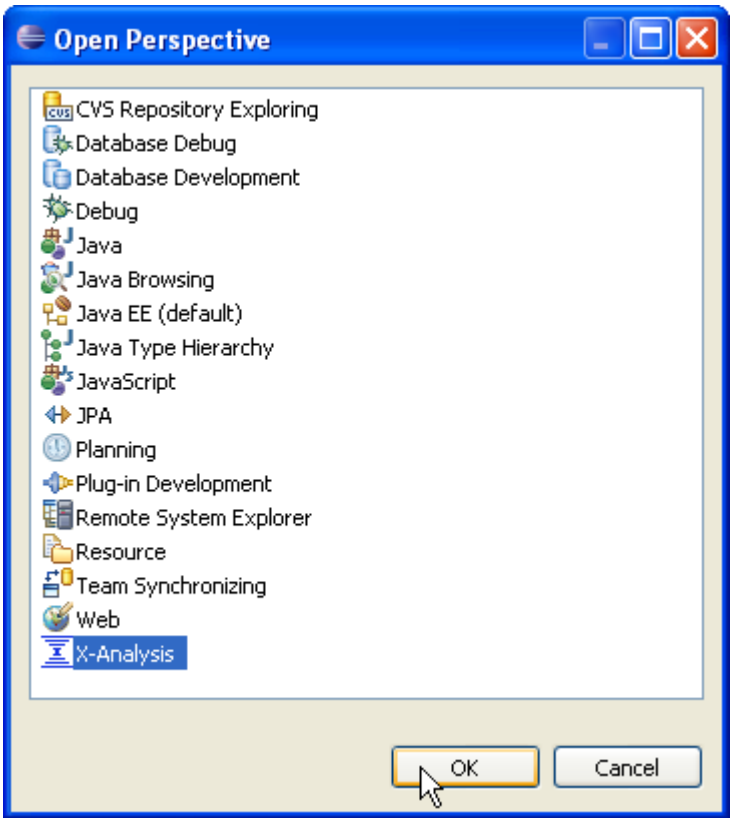
Start IBM's RDi / RDp / WDSC/ or Eclipse 3.2 and above.

Select Windows > Open Perspective > Other > X-Analysis

Open Perspective menu



Select X-Analysis Perspective



Click the **OK** button to start the X-Analysis Perspective.

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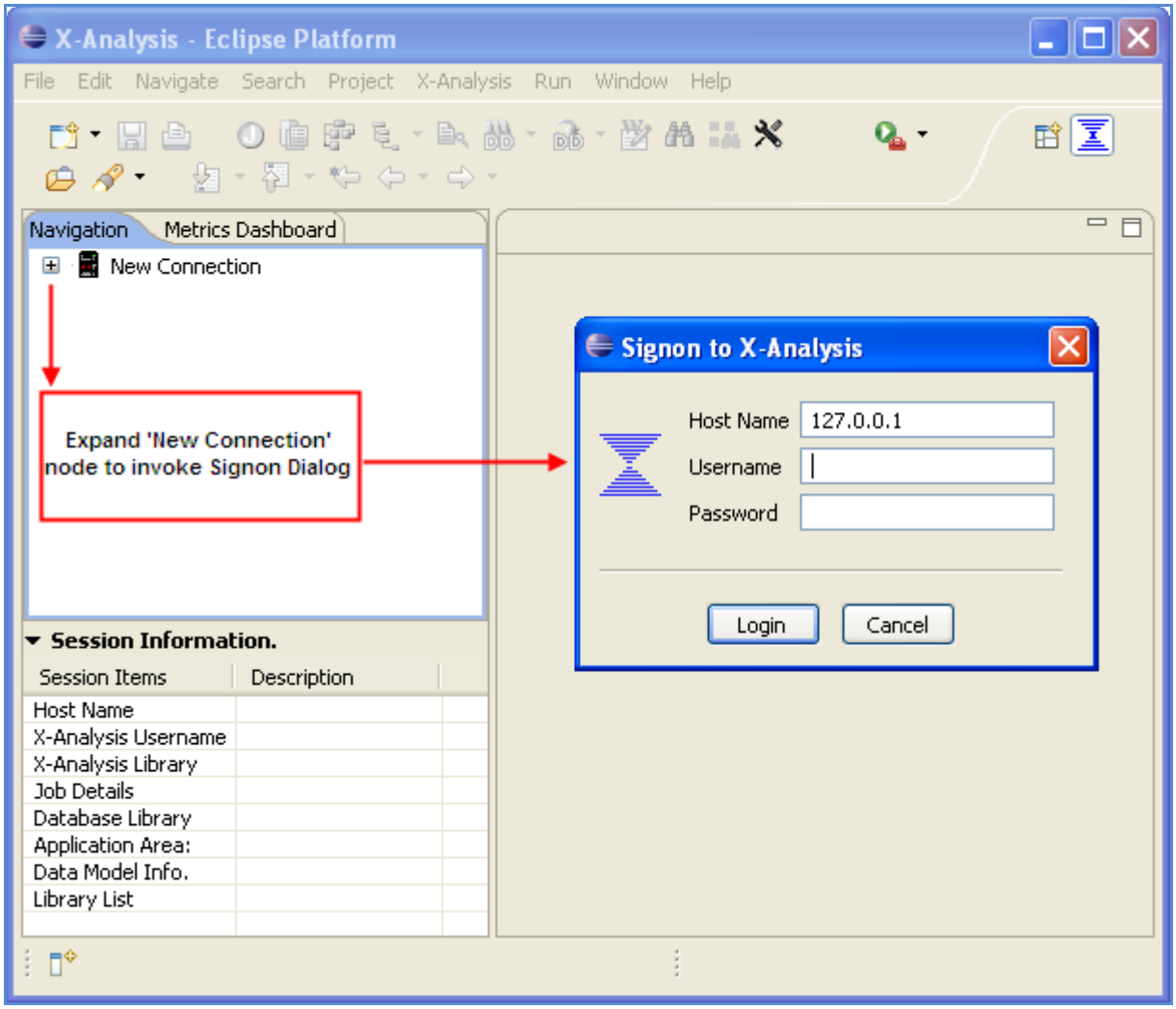
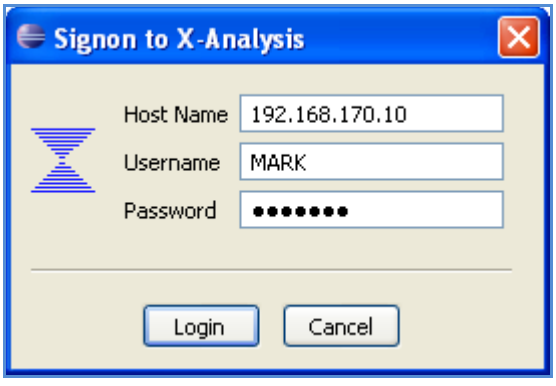
X-Analysis Perspective



Expand **New Connection** node to bring up the Signon Dialog.

X-Analysis Signon Dialog



Instructions to fill the **Signon** dialog:

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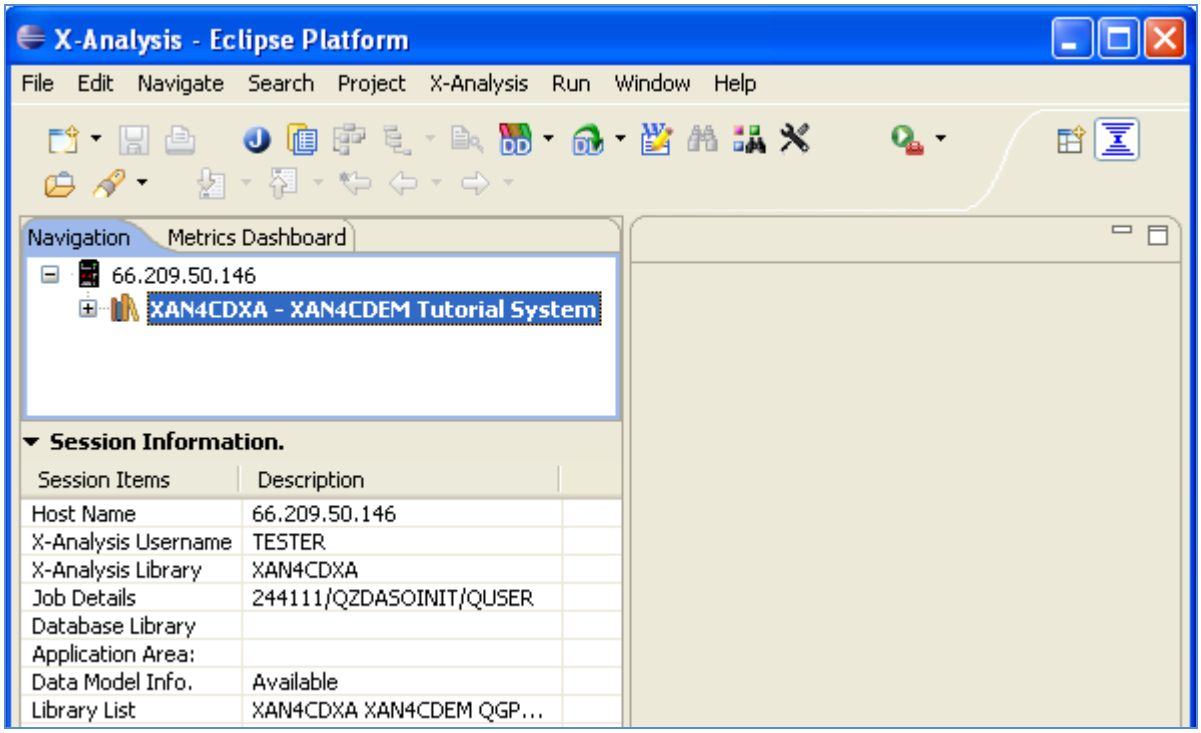
1. Enter TCP/IP address/Computer Name of the IBM i to be accessed.
2. Enter username and password of a valid IBM i profile.
3. Click **Login** button.

After a successful signon, X-Analysis Client displays a list of application libraries. These libraries are initialised using the master command X4WRKAPP on IBM i.

Application Library

When used for the first time the X-Analysis Client displays only one application library – **XAN4CDXA**.

X-Analysis Client displaying Application Library



Different nodes (options) are available under the cross-reference library node - XAN4CDXA. Expand **XAN4CDXA** node to see the available options.

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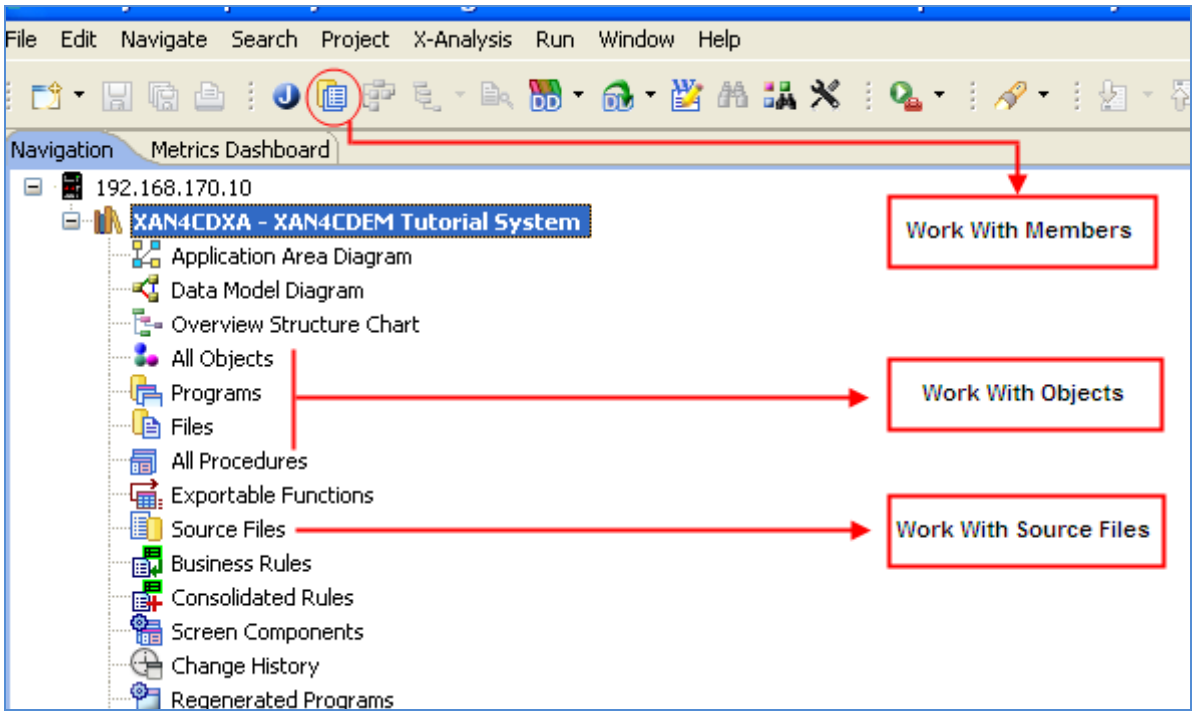
Application Library expanded



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Chapter 3: Analysis & Documentation

Before we begin to read into the sophisticated features of the specialized Analysis and Documentation solution set by X-Analysis, it is very important to learn why analysis and documentation has become such a major concern. When business applications (the in-house business codes aka legacy applications) are programmatically written, their longevity and success is the result of well-crafted application designs. Although more than four decades have elapsed, thousands of IBM i applications are still in use. However, it is said, “change is the only constant.” Therefore, superior application designs notwithstanding – reasons like continual technical enhancements, syntax, variations in programming styles, financial and time constraints, and absence of original application designers and/or monolithic application codes – have rendered changes inevitable for the existent application designs.

When these monolithic application tomes are decoded, system analysts or software professionals become equipped to remap the designs using the latest technical format, in keeping with the present or future requirements of the business.

It is here that the role of X-Analysis is manifest. The Analysis and Documentation tool set is patterned to convert all IBM i applications in the latest format. This software suite has precise tools for conducting advanced application and documentation work minus the legacy code’s redundancy and complexity.

In this chapter, you will learn about the specialized Analysis & Documentation solution set. The chapter explains how by using this tool you can avail of prompt and automated documenting and computing solutions.

The chapter contains:

- Chronology of features
- Work with Objects
- Object Where Used
- Export List to PDF/MS Word or MS Excel
- Data Flow Diagram
- Variable Where Used
- Structure Chart Diagram
- Detailed Structure Chart
- Hierarchal Structure Chart
- Document Manager
- Source Browser

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Chronology of Features

The Analysis & Documentation solution set is a sophisticated tool for instant and automated cross-referencing, impact analysis and graphical documentation of Synon/2E, RPG, and COBOL applications. All the functionality above (& more) is contained in the following separate features, used in this tutorial:

- **Work with Objects** – It is a list of all the objects in a chosen application or application area.
- **Object Where Used** – It is a list of all usage references for an object.
- **Export List to PDF/Microsoft Word or Microsoft Excel** – The option to export data to MS Excel or a PDF/MS Word.
- **Data Flow Diagram –** It is an interactive, colour coded and bus routing block diagram for an object relationship within an application.
- **Variable Where Used –** It is a list of all source lines with references within source members made to fields/variables of a file/program, their associated device files, and copybooks.
- **Structure Chart Diagram –** It is a graphic display for displaying program-to-program relationships.
- **Detailed Structure Chart Diagram –** It is a graphic display for showing program-to-program relationships with files used by each program. It also displays each program's generated program text.
- **Hierarchal Structure Chart Diagram –** Colour-coded bus routing block diagram enhances the visual of program-to-program interrelationships. User gets an exact idea of the hierarchy in which the programs are set.
- **Document Manager –** A utility that automatically generates structured system document in PDF / MS Word format.
- **Source Browser –** It is an interface for system analysis, reviewing, re-factoring, maintaining, and redeveloping in source code.
- **Source Browser Toolbar –** This toolbar contains a list of different options for viewing code within the Source Browser, such as Pseudo Code and Source View Level options etc.
- **Other Source Browser Options** – These are all the extra Source Browser options.

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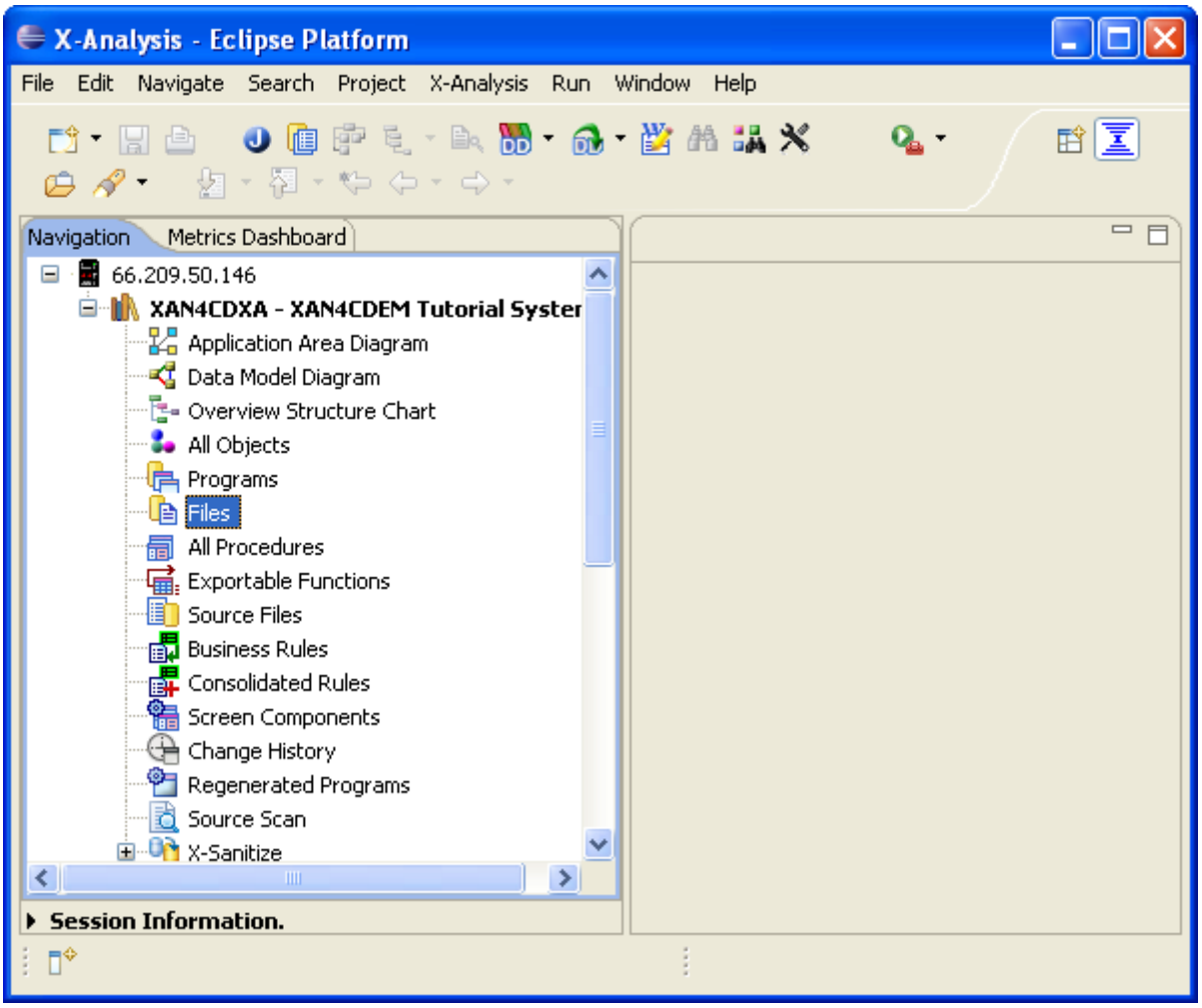
Work with Objects

Work with Objects displays a list of all the objects for a chosen application / application area.

To generate object list for all files, double click **Files** node available under the application Library.

X-Analysis displaying Files Node



The double click action invokes the 'Work with Objects' dialog with 'Type' set as *FILE and 'Attribute' as PF.

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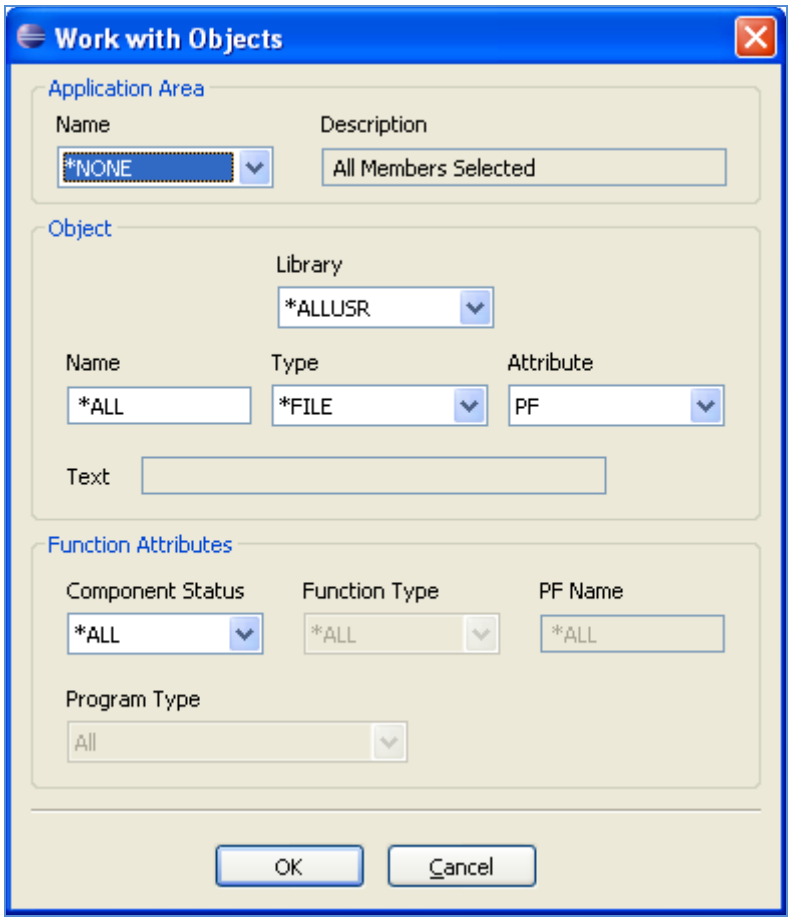
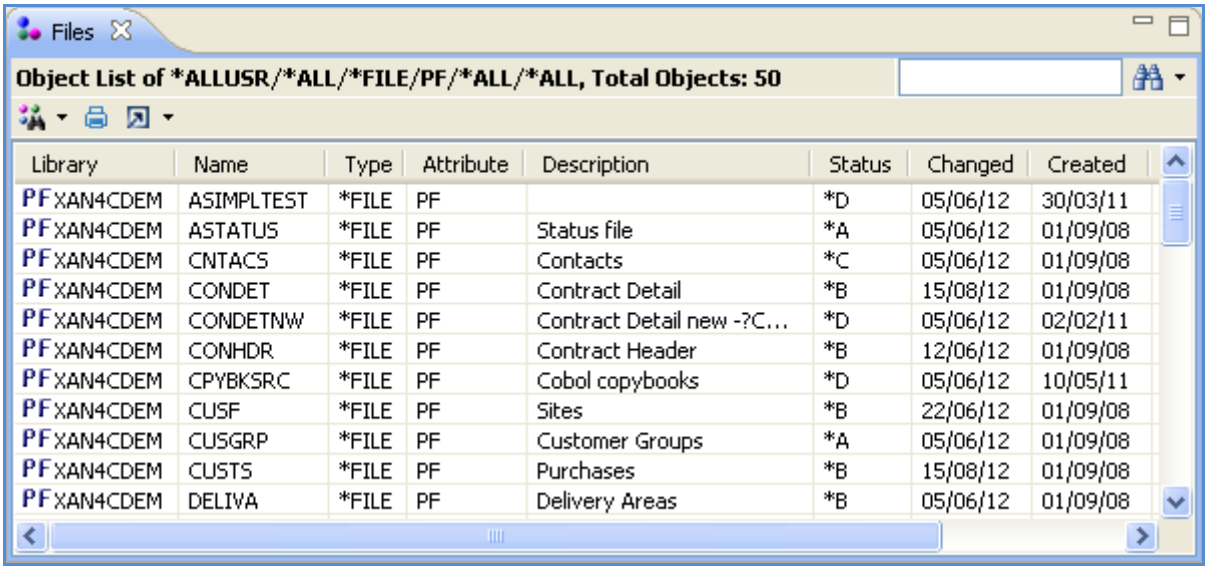
Work with Objects dialog



Click the **OK** button to invoke the Object List window displaying all files.

Object List Window displaying all Files (PF)



Library	Name	Type	Attribute	Description	Status	Changed	Created
PF XAN4CDEM	ASIMPLTEST	*FILE	PF		*D	05/06/12	30/03/11
PF XAN4CDEM	ASTATUS	*FILE	PF	Status file	*A	05/06/12	01/09/08
PF XAN4CDEM	CNTACS	*FILE	PF	Contacts	*C	05/06/12	01/09/08
PF XAN4CDEM	CONDET	*FILE	PF	Contract Detail	*B	15/08/12	01/09/08
PF XAN4CDEM	CONDETNW	*FILE	PF	Contract Detail new -?C...	*D	05/06/12	02/02/11
PF XAN4CDEM	CONHDR	*FILE	PF	Contract Header	*B	12/06/12	01/09/08
PF XAN4CDEM	CPYBKSRC	*FILE	PF	Cobol copybooks	*D	05/06/12	10/05/11
PF XAN4CDEM	CUSF	*FILE	PF	Sites	*B	22/06/12	01/09/08
PF XAN4CDEM	CUSGRP	*FILE	PF	Customer Groups	*A	05/06/12	01/09/08
PF XAN4CDEM	CUSTS	*FILE	PF	Purchases	*B	15/08/12	01/09/08
PF XAN4CDEM	DELIVA	*FILE	PF	Delivery Areas	*B	05/06/12	01/09/08

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The object list window is a multicolumn display.

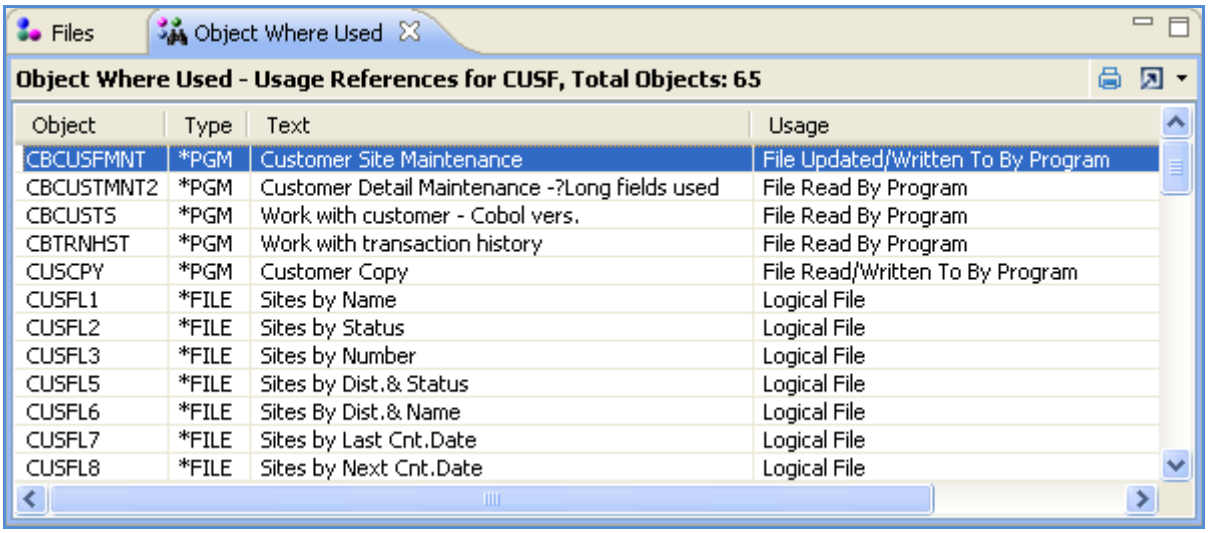
In this window, a user can sort a column data with a single click of a column heading.

Object Where Used

The Object Where Used feature generates a list of all usage references for an object.

To make an Object Where Used list for the object CUSF, locate and select the object CUSF. Right click on CUSF and select **Usage References** from the sub menu **Object Where Used**. This brings up the Object Where Used list for the Usage References of the object CUSF.

Object Where Used


Files
Object Where Used
Object Where Used - Usage References for CUSF, Total Objects: 65
Object
Type
Text
Usage
CBCUSFMNT *PGM Customer Site Maintenance File Updated/Written To By Program
CBCUSTMNT2 *PGM Customer Detail Maintenance -?Long fields used File Read By Program
CBCUSTS *PGM Work with customer - Cobol vers. File Read By Program
CBTRNHST *PGM Work with transaction history File Read By Program
CUSCPY *PGM Customer Copy File Read/Written To By Program
CUSFL1 *FILE Sites by Name Logical File
CUSFL2 *FILE Sites by Status Logical File
CUSFL3 *FILE Sites by Number Logical File
CUSFL5 *FILE Sites by Dist.& Status Logical File
CUSFL6 *FILE Sites By Dist.& Name Logical File
CUSFL7 *FILE Sites by Last Cnt.Date Logical File
CUSFL8 *FILE Sites by Next Cnt.Date Logical File

The **Object Where Used** window is a multicolumn display. The Usage column displays uses of the object CUSF in a particular object. The 'Object Where Used' window also allows a user to drill down to a specific line of code where the object is used.

Scroll down to the object CUSTMNT1 in the 'Object Where Used' window, displayed below.

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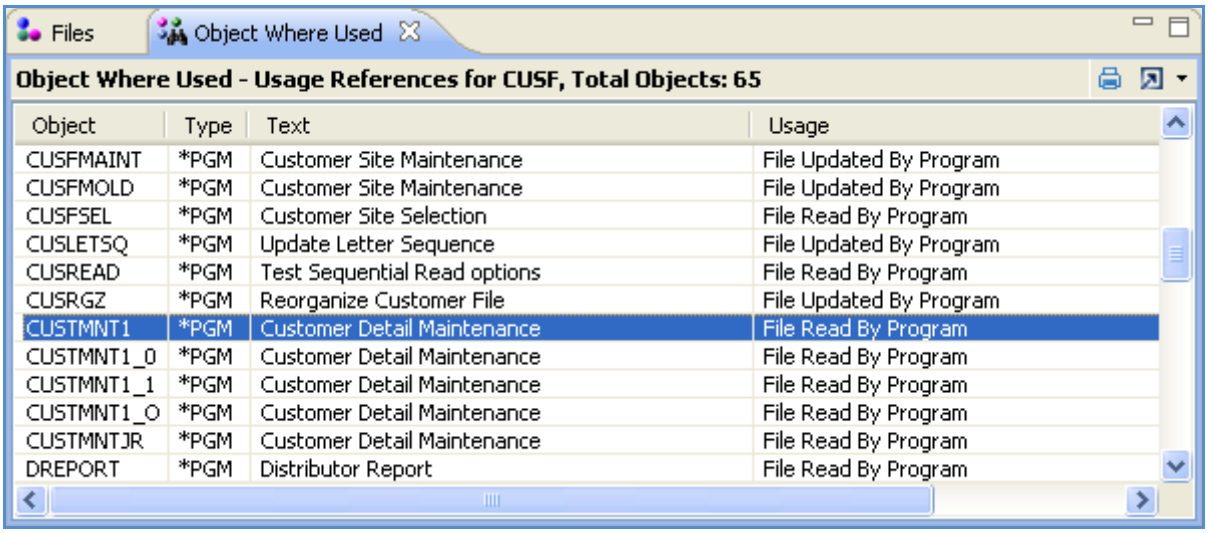
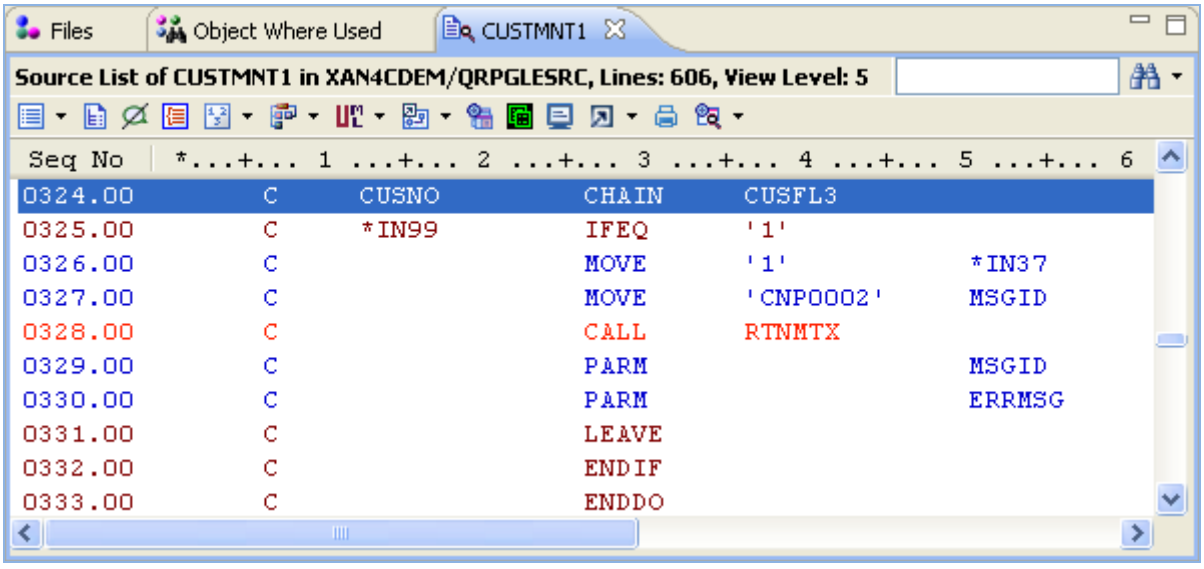
Object Where Used with CUSTMNT1 selected


Files
Object Where Used
Object Where Used - Usage References for CUSF, Total Objects: 65
Object Type Text Usage
CUSFMAINT *PGM Customer Site Maintenance File Updated By Program
CUSFMOLD *PGM Customer Site Maintenance File Updated By Program
CUSFSEL *PGM Customer Site Selection File Read By Program
CUSLETSQ *PGM Update Letter Sequence File Updated By Program
CUSREAD *PGM Test Sequential Read options File Read By Program
CUSRGZ *PGM Reorganize Customer File File Updated By Program
CUSTMNT1 *PGM Customer Detail Maintenance File Read By Program
CUSTMNT1_0 *PGM Customer Detail Maintenance File Read By Program
CUSTMNT1_1 *PGM Customer Detail Maintenance File Read By Program
CUSTMNT1_O *PGM Customer Detail Maintenance File Read By Program
CUSTMNTJR *PGM Customer Detail Maintenance File Read By Program
DREPORT *PGM Distributor Report File Read By Program

Double click on the row displaying **CUSTMNT1**. This retrieves the source member for the object CUSTMNT1 with the line highlighted referring to the object CUSF.

Drill down to an individual line for the Object Where Used Reference


Files
Object Where Used
CUSTMNT1
Source List of CUSTMNT1 in XAN4CDEM/QRPGLESRC, Lines: 606, View Level: 5
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0324.00 C CUSNO CHAIN CUSFL3
0325.00 C *IN99 IFEQ '1'
0326.00 C MOVE '1' *IN37
0327.00 C MOVE 'CNP0002' MSGID
0328.00 C CALL RTNMTX
0329.00 C PARM MSGID
0330.00 C PARM ERRMSG
0331.00 C LEAVE
0332.00 C ENDIF
0333.00 C ENDDO

Export List to PDF/Microsoft Word or Microsoft Excel

X-Analysis provides a facility to export data from any displayed window. The window toolbar on the 'Object Where Used' view has an 'Export Options' dropdown button, with 'Export to PDF' / 'Export to MS Word' and 'Export to MS Excel' as options.

Select your desired option to export the list into PDF/MS Word or Excel.

Use X-Analysis preferences to set export option as PDF or MS Word.

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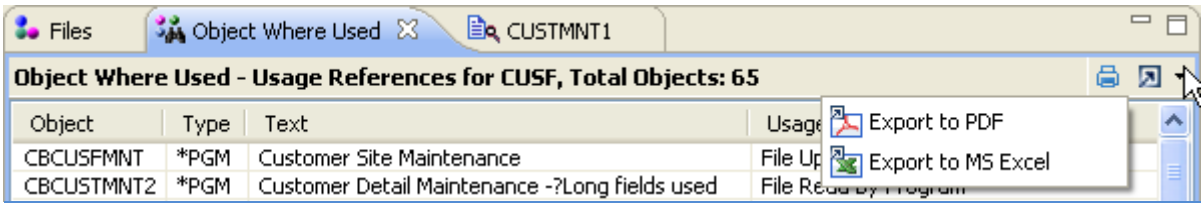
Export icon on Object Where used



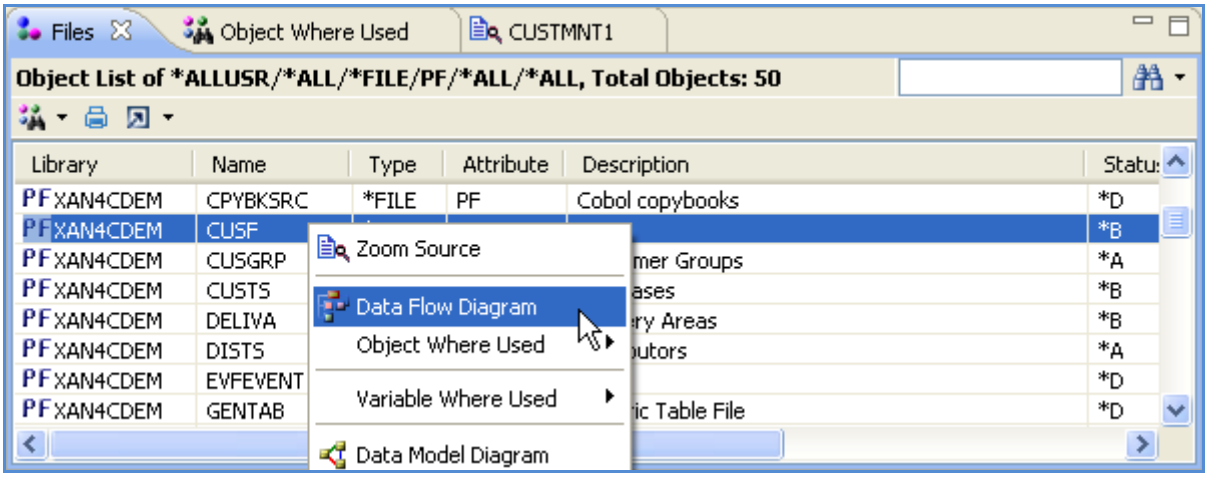
Data Flow Diagram / DFD

A DFD, as the name suggests, is a pictorial representation of data flow. It depicts the interrelationships among all the files and programs contained within a particular application. A colour-coded DFD simultaneously plays the dual role of showing the data flow at high object level, besides providing contextual details regarding specific variables and parameters passed between objects.

The Bus Routing Block Diagram gives user an idea of where and how the data that is input affects the output required / enables user to see how an object within an application relates with other objects. The Bus arrangement helps even non-technical user to gain clarity into how a particular object correlates with the other(s).

The user can generate a DFD by navigating back to the object list using the navigation arrows available on the Eclipse toolbar. The user must select the object CUSF and then choose **Data Flow Diagram** option from the context menu, as shown below:

Data Flow Diagram option



This brings up the DFD for the object CUSF.

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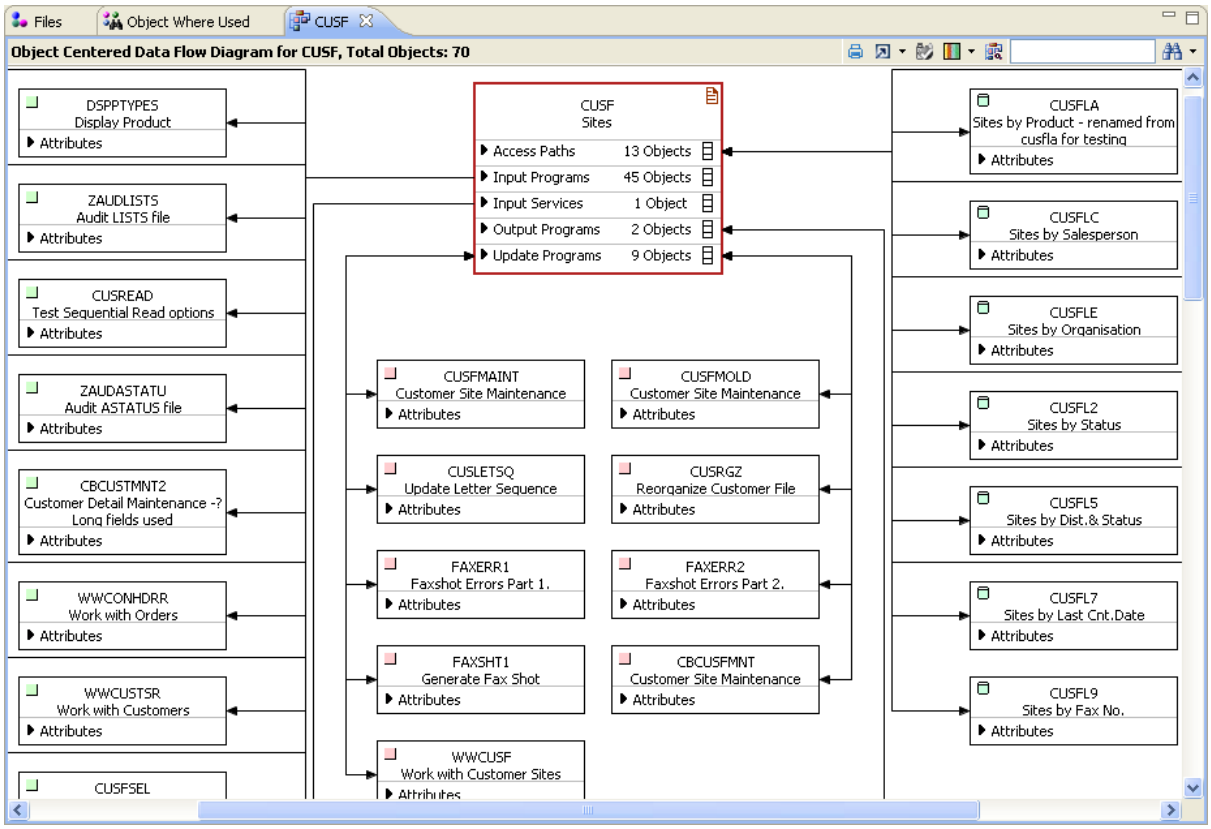
Data Flow Diagram



The DFD is also a graphic equivalent of the 'Object Where Used' data. Besides the Logical Views/Access Paths for CUSF, a user can see how CUSF fits into the application. (i.e. the programs that update CUSF, programs that use CUSF as an input file and so on).

The dynamic and interactive diagram facilitates user with access to other features contained within an object. There are features and options as varied and flexible like Hide/Show Object, Expand/Collapse Referenced Objects, View Annotation, Attributes – all of these and more are explained in the sections ahead.

Hide/Show Object

At times, in order to have better understanding of object interrelationships, user may want to hide/show all objects pertaining to programs. A single click action on the icon alongside the objects enables the user to hide/show objects. In the following screenshot, the icon against **Access Paths** is clicked to hide objects.

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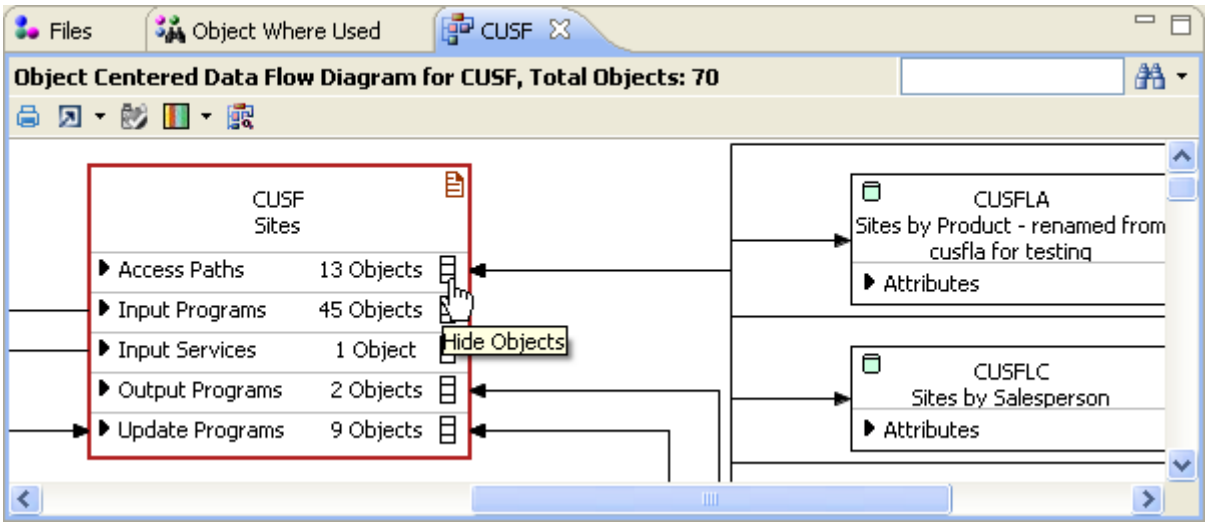
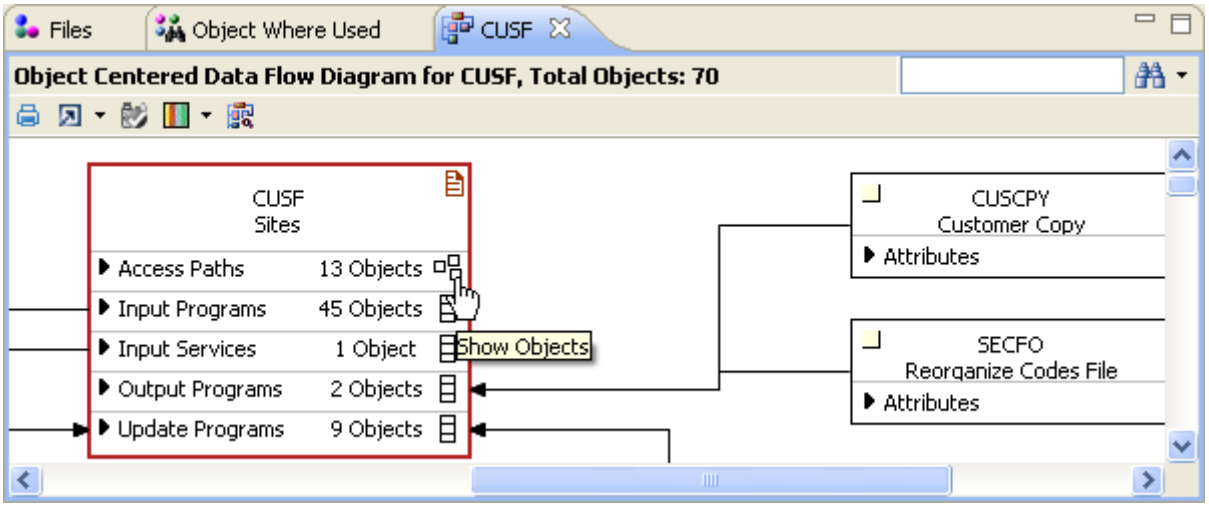
Hide Option for Objects



The following screenshot shows how another click displays all the objects within.

Show Options for Objects



Expand/Collapse Referenced Objects

The DFD takes another dynamic form when user gets to expand the referenced object(s) on selecting a particular category from the main object's box. The following screenshot displays the action to be performed:

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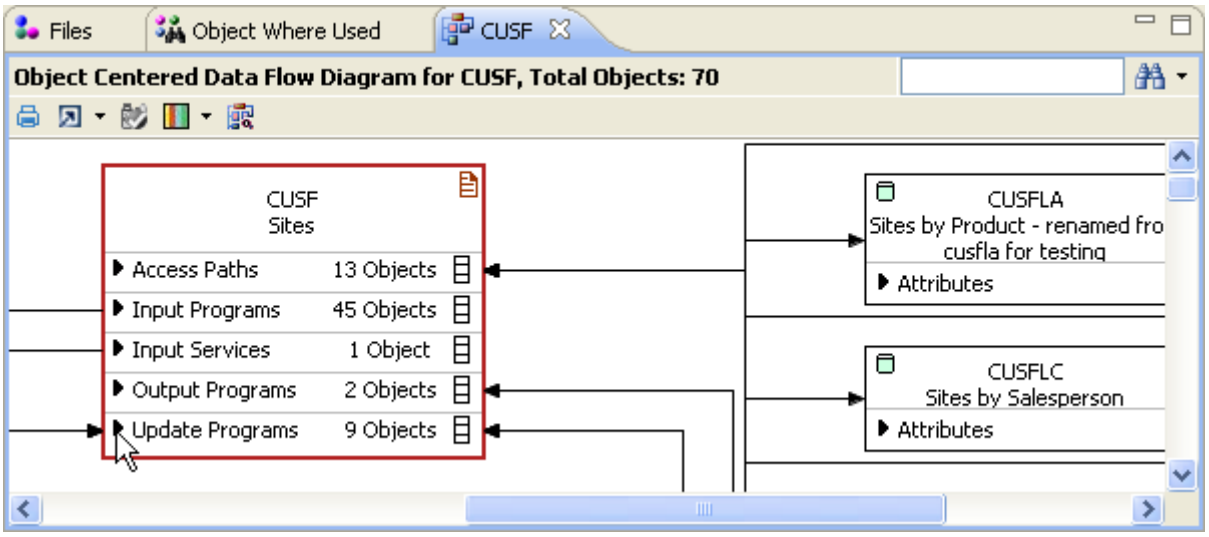
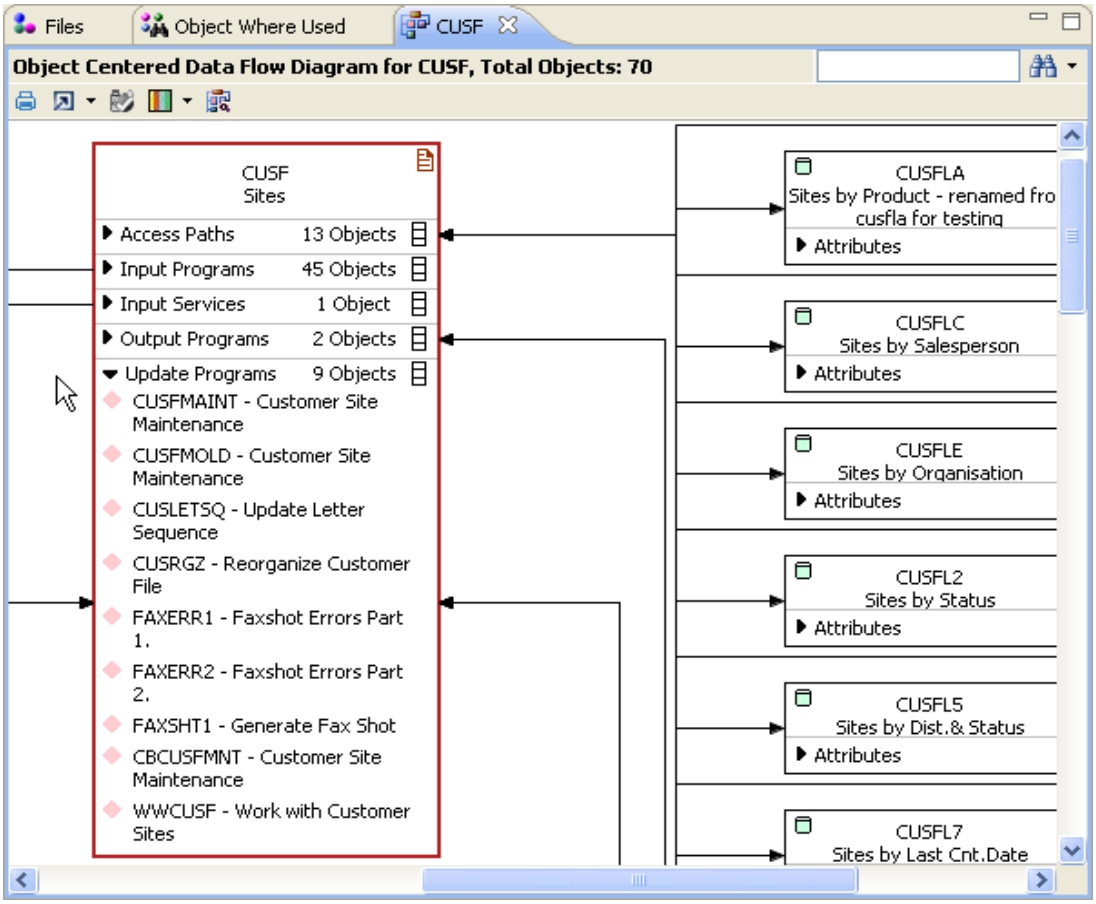
Expand Referenced Objects



A single click on the arrow icon adjacent to **Update Programs** reveals all objects updating the file CUSF. The following screenshot displays the expanded referenced objects list:

Expanded view of Update Programs



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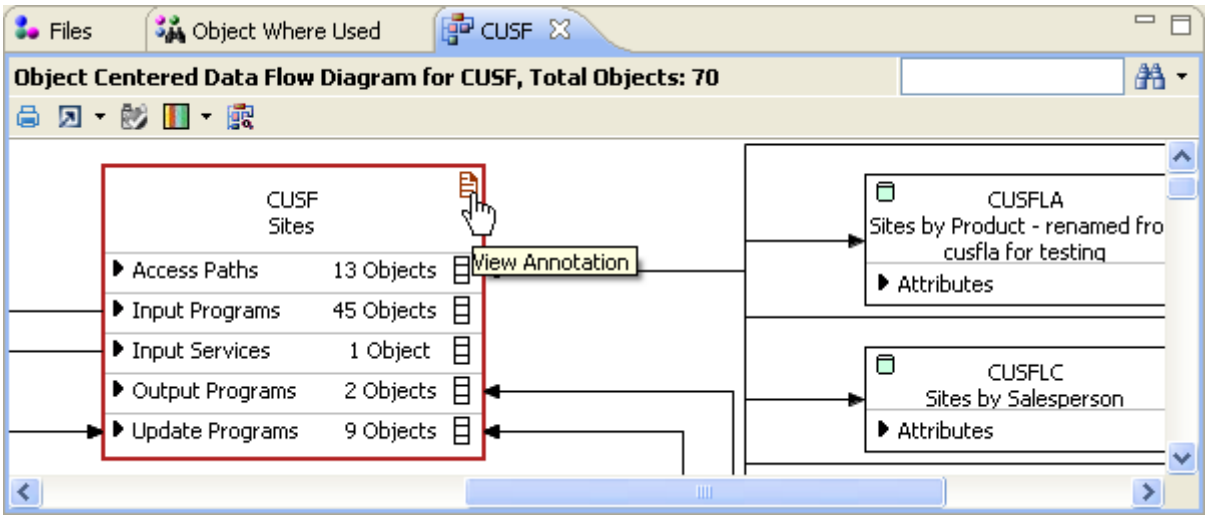
View Annotation

The View Annotation option allows user to see annotation for a specific object. There is a red icon on the right side of the Object that denotes Annotated text (see the following screenshot).

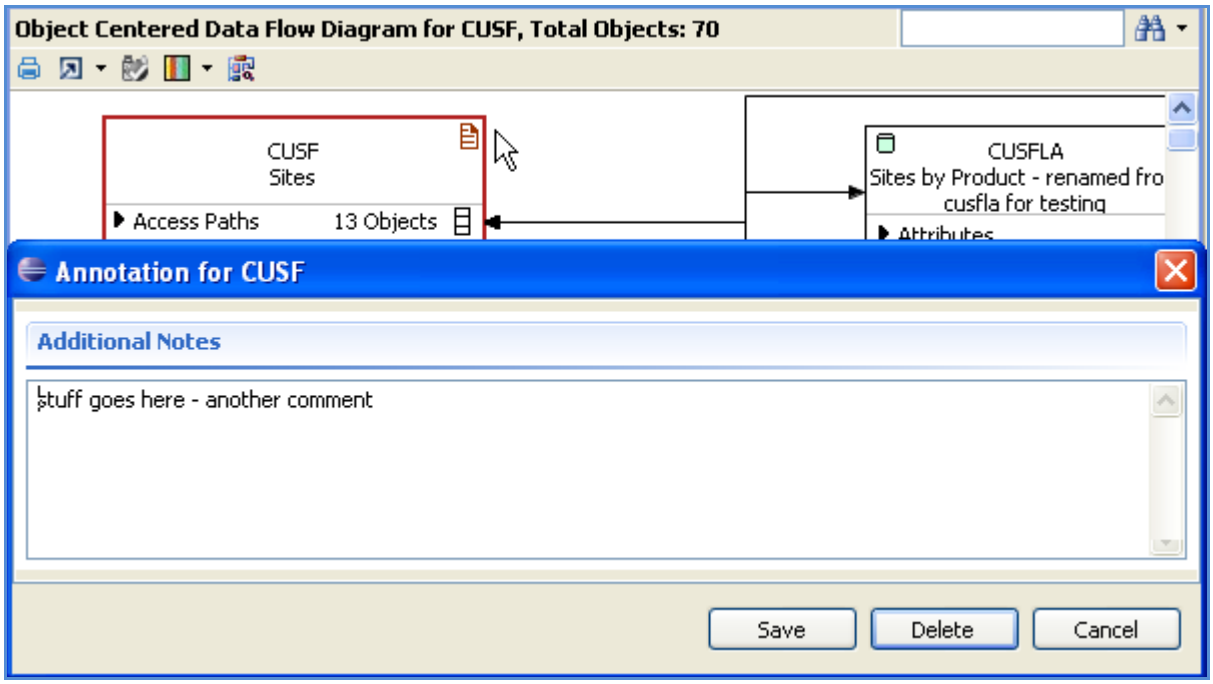
View Annotation Option



Double clicking on the **View Annotation** icon invokes the annotation dialog box, displaying the notes that had been written earlier.

The user can further add/modify notes in the annotation dialog box and click on the **Save** button. These notes will be viewable later using the same option.

Annotation Dialog



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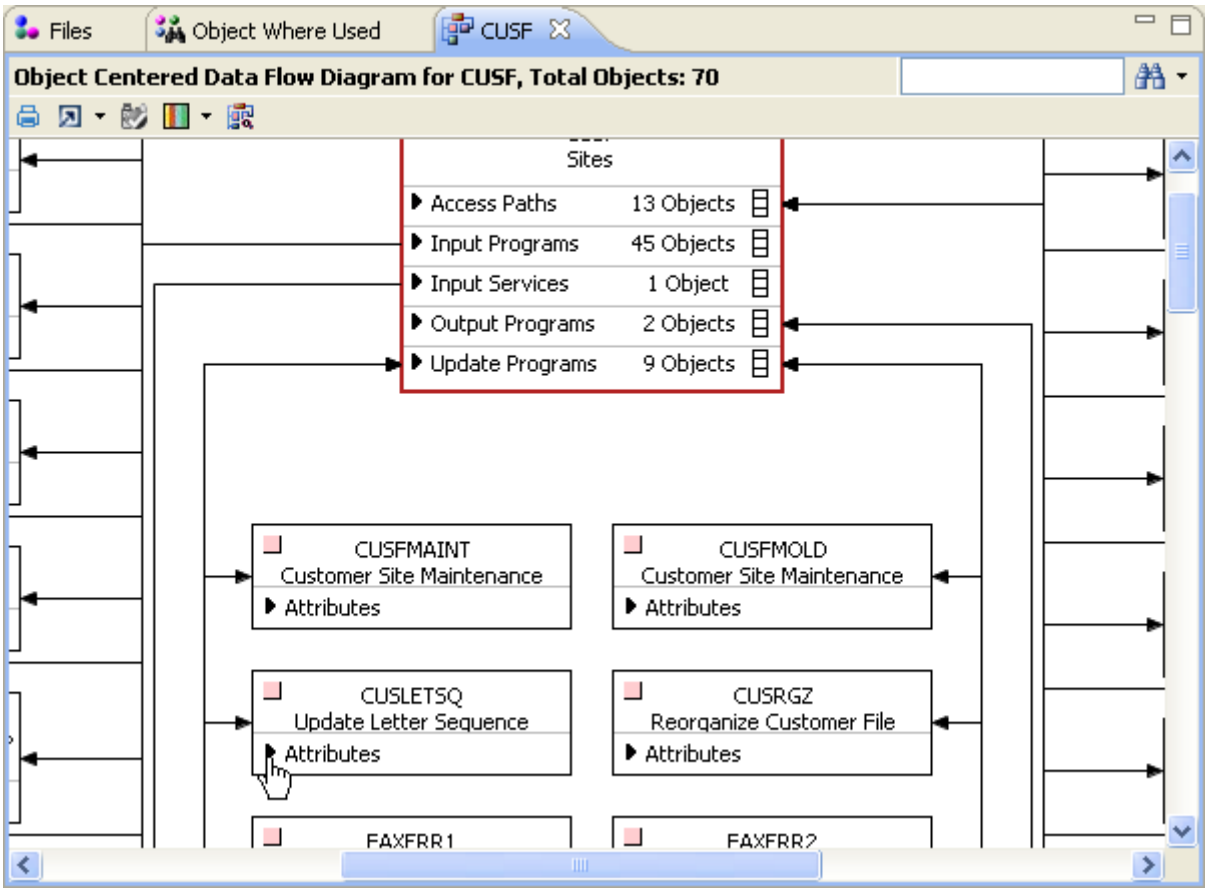
Attributes

The ‘Attributes’ feature comprises impacted fields of a particular object. Through these fields, the main object is referenced.

Expand Attribute Icon



The different objects corresponding to the main object have fields within them, implicit as ‘Attributes’. These are easily accessible by a single click on the ‘Attributes’ icon. The term ‘Attributes’ is changed to related attribute – input, update, output etc., on expanding ‘Attributes’ button, as shown below:

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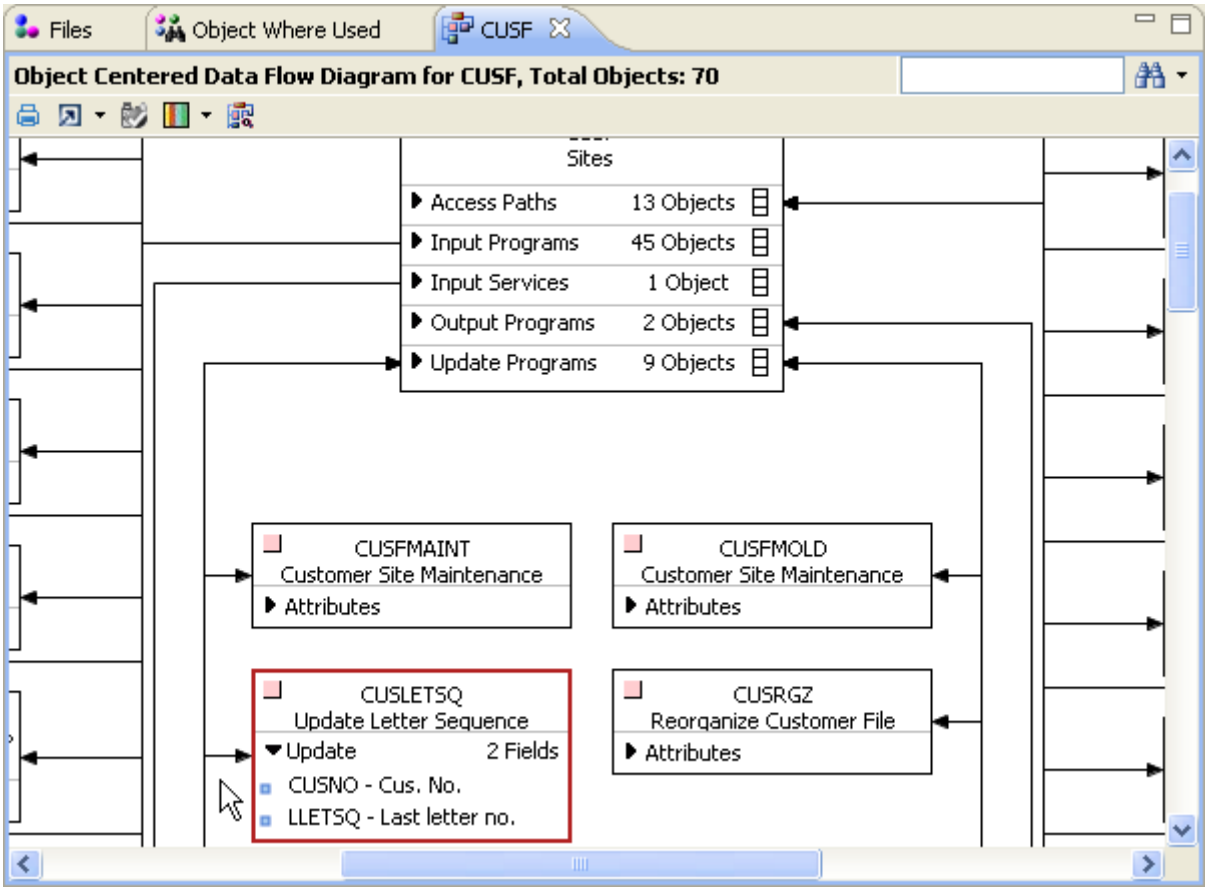
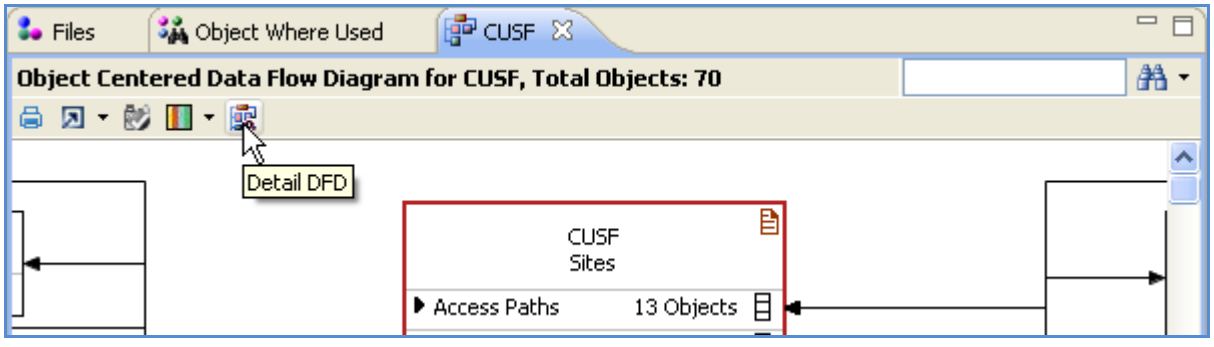
Expanded Attributes



Detailed DFD Icon

User can opt for the Detailed DFD from the toolbar for viewing field usage of all the objects.

Detailed DFD Icon



When user clicks on the Detailed DFD icon the 'Attributes' section of all the objects gets expanded displaying referred fields from all objects. The following screenshot displays the detailed DFD screen:

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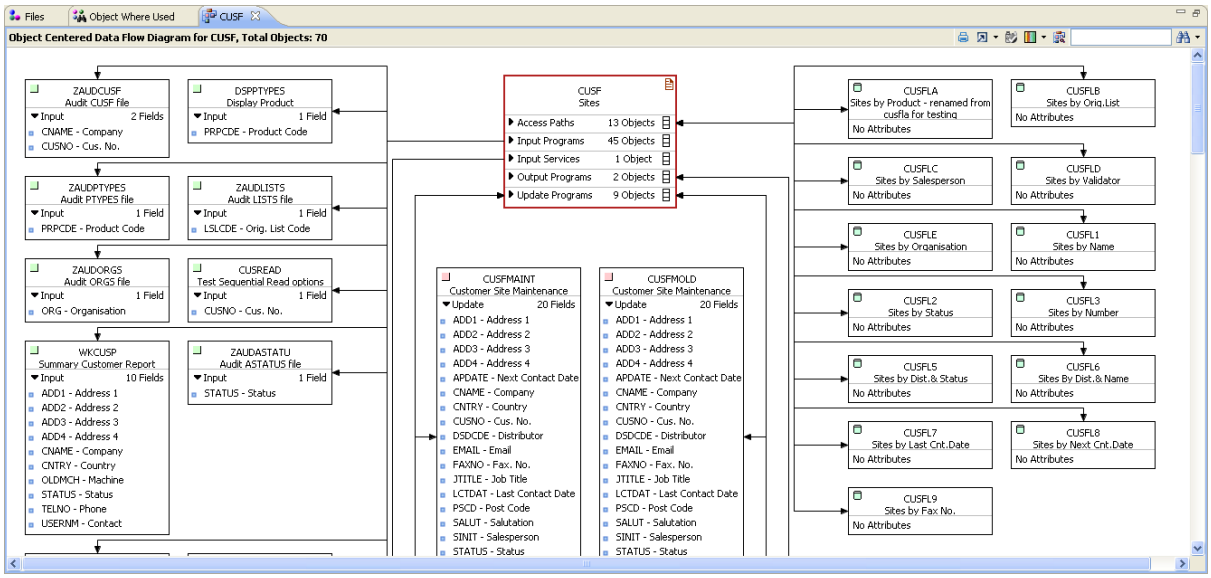
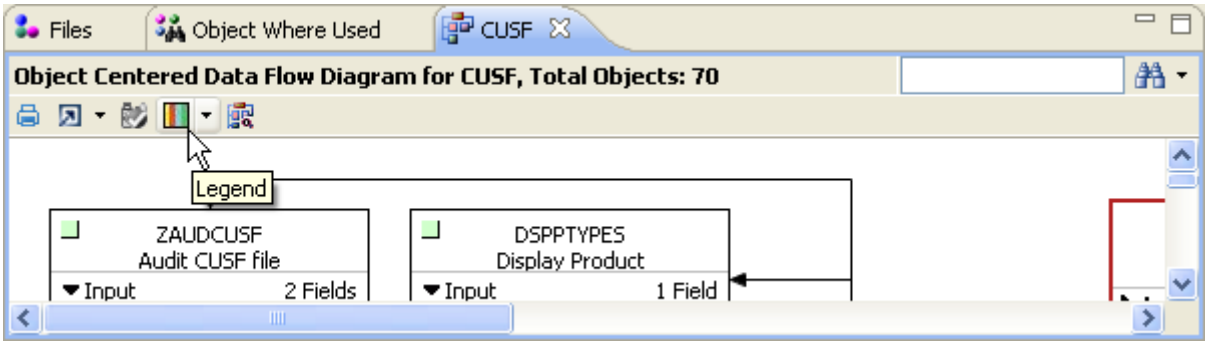
Detailed DFD View



Legend Icon

The Legend icon on the Eclipse toolbar displays details of the colour scheme used by DFD. Click the Legend icon. As shown below:

Legend Icon



The colour scheme helps user to understand the reference and association of specific objects.

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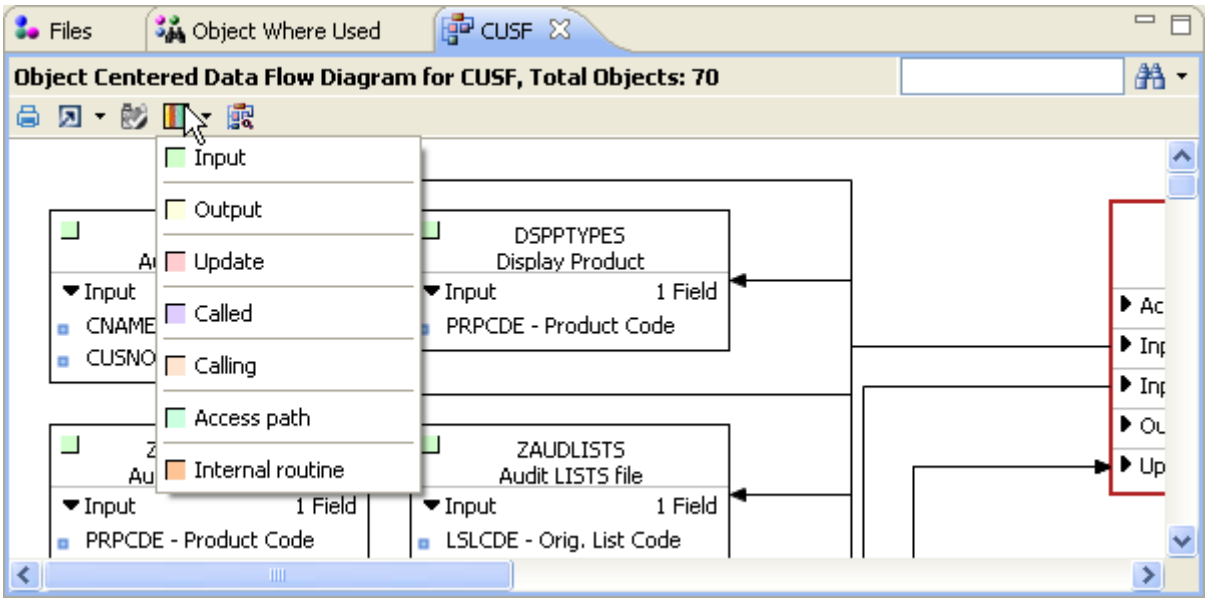
Legend Expanded



Variable Where Used

This specific option is for conducting impact analysis. The option basically, apprises you of the entire source lines where the field/variable of a file or program has been used and/or referenced in any of the source members and their associated device files and copybooks.

Throughout an application, the Variable Where Used option lists all source lines with references within source members made to fields/variables of a file/program, their associated device files, and copybooks.

Continuing with the same example, i.e. OE002, we can figure out that the fields used by object CUSF are CUSNO and PRPCDE. Select CUSNO and opt **Variable Where Used** from the context menu.

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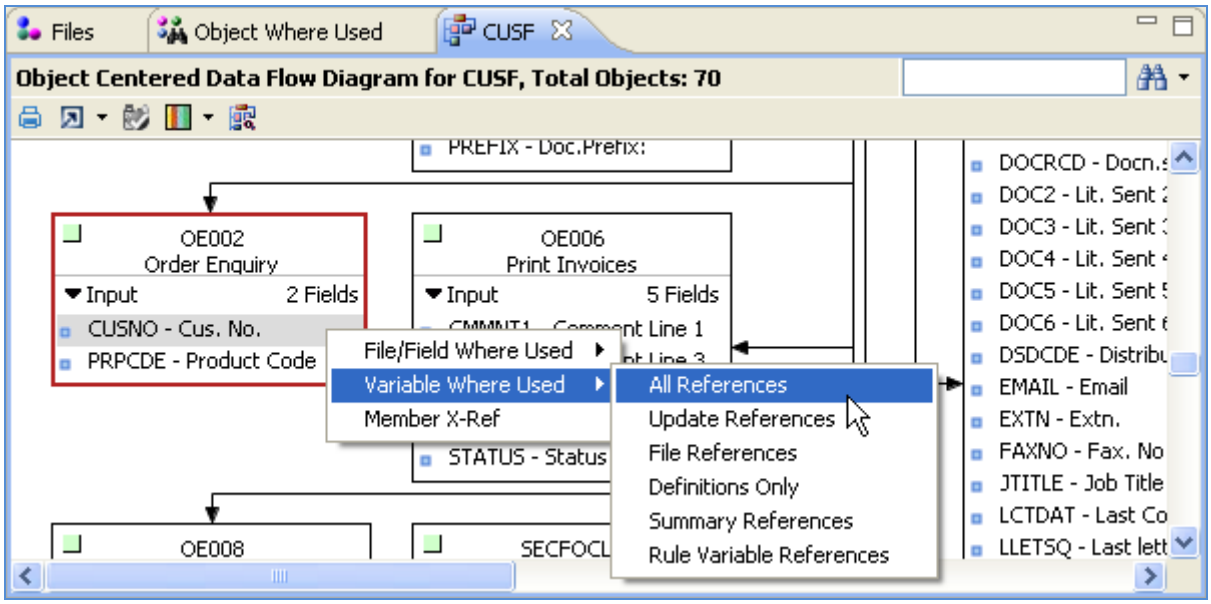
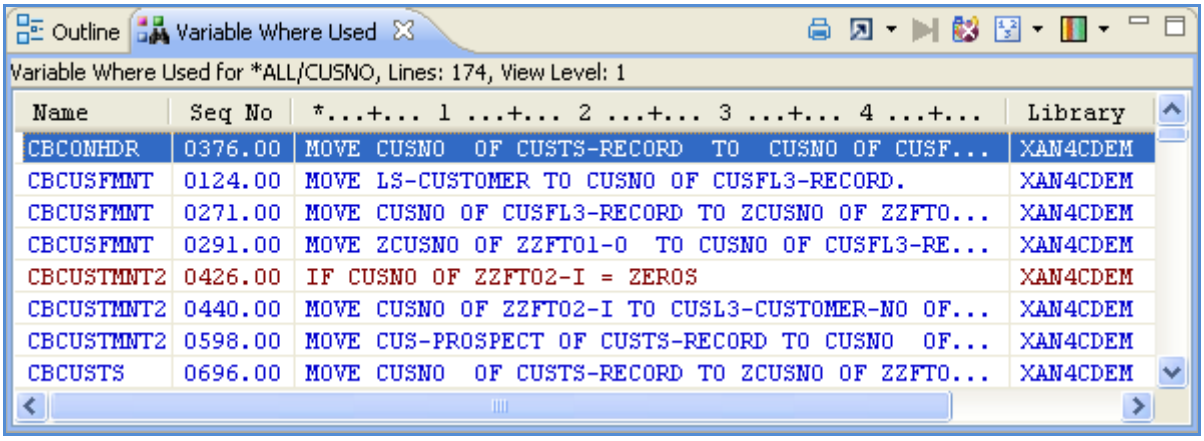
Variable Where Used option for CUSNO



Select **All References** option to invoke the Variable Where Used window for the field CUSNO.

Variable Where Used view for CUSNO



Name	Seq No	*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+...	Library
CBCONHDR	0376.00	MOVE CUSNO OF CUSTS-RECORD TO CUSNO OF CUSF...	XAN4CDEM
CBCUSFMNT	0124.00	MOVE LS-CUSTOMER TO CUSNO OF CUSFL3-RECORD.	XAN4CDEM
CBCUSFMNT	0271.00	MOVE CUSNO OF CUSFL3-RECORD TO ZCUSNO OF ZZFTO...	XAN4CDEM
CBCUSFMNT	0291.00	MOVE ZCUSNO OF ZZFT01-O TO CUSNO OF CUSFL3-RE...	XAN4CDEM
CBCUSTMNT2	0426.00	IF CUSNO OF ZZFT02-I = ZEROS	XAN4CDEM
CBCUSTMNT2	0440.00	MOVE CUSNO OF ZZFT02-I TO CUSL3-CUSTOMER-NO OF...	XAN4CDEM
CBCUSTMNT2	0598.00	MOVE CUS-PROSPECT OF CUSTS-RECORD TO CUSNO OF...	XAN4CDEM
CBCUSTS	0696.00	MOVE CUSNO OF CUSTS-RECORD TO ZCUSNO OF ZZFTO...	XAN4CDEM

The window displayed above lists all references of field CUSNO from the entire application.

The ‘View Level Menu’ icon is located on the X-Analysis toolbar, and the menu allows for seven levels of Variable Where Used information.

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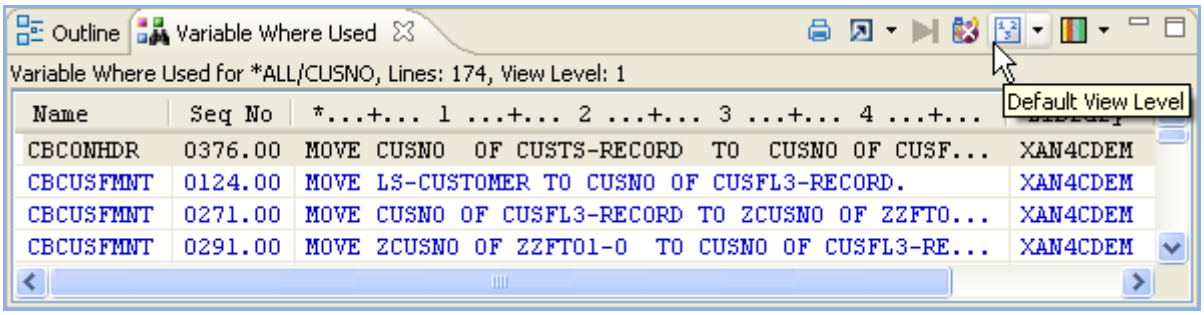
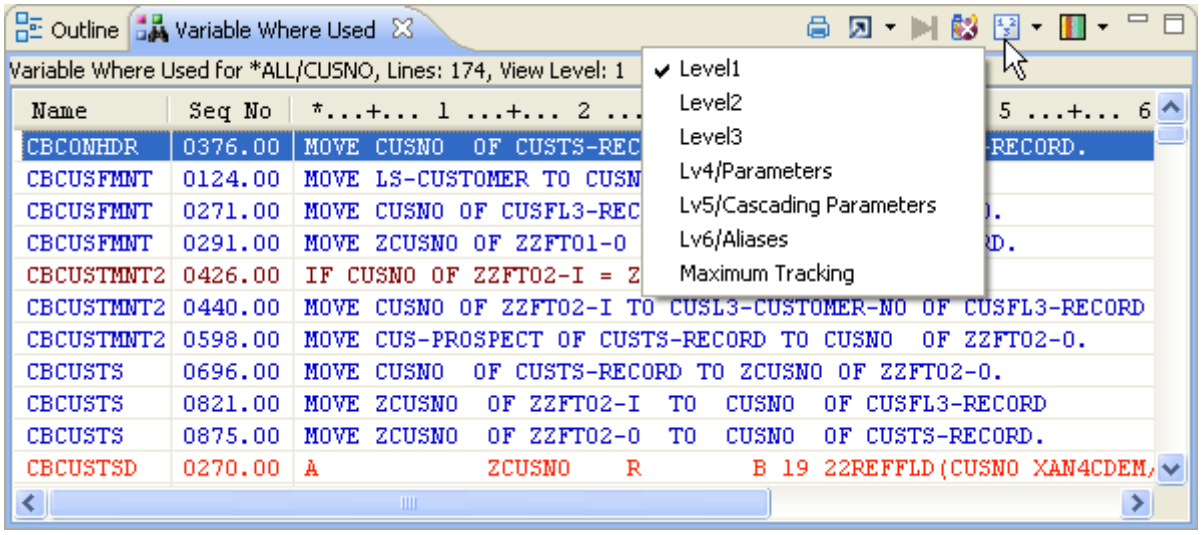
View Level Menu


Outline
Variable Where Used
Variable Where Used for *ALL/CUSNO, Lines: 174, View Level: 1
Default View Level
Name Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+...
CBCONHDR 0376.00 MOVE CUSNO OF CUSTS-RECORD TO CUSNO OF CUSF... XAN4CDEM
CBCUSFMNT 0124.00 MOVE LS-CUSTOMER TO CUSNO OF CUSFL3-RECORD. XAN4CDEM
CBCUSFMNT 0271.00 MOVE CUSNO OF CUSFL3-RECORD TO ZCUSNO OF ZZFTO... XAN4CDEM
CBCUSFMNT 0291.00 MOVE ZCUSNO OF ZZFTO1-O TO CUSNO OF CUSFL3-RE... XAN4CDEM

Expanded View Level Menu


Outline
Variable Where Used
Variable Where Used for *ALL/CUSNO, Lines: 174, View Level: 1
Level1
Level2
Level3
Lv4/Parameters
Lv5/Cascading Parameters
Lv6/Aliases
Maximum Tracking
Name Seq No *...+... 1 ...+... 2 ...
CBCONHDR 0376.00 MOVE CUSNO OF CUSTS-REC
CBCUSFMNT 0124.00 MOVE LS-CUSTOMER TO CUSN
CBCUSFMNT 0271.00 MOVE CUSNO OF CUSFL3-REC
CBCUSFMNT 0291.00 MOVE ZCUSNO OF ZZFTO1-O
CBCUSTMNT2 0426.00 IF CUSNO OF ZZFTO2-I = Z
CBCUSTMNT2 0440.00 MOVE CUSNO OF ZZFTO2-I TO CUSL3-CUSTOMER-NO OF CUSFL3-RECORD
CBCUSTMNT2 0598.00 MOVE CUS-PROSPECT OF CUSTS-RECORD TO CUSNO OF ZZFTO2-O.
CBCUSTS 0696.00 MOVE CUSNO OF CUSTS-RECORD TO ZCUSNO OF ZZFTO2-O.
CBCUSTS 0821.00 MOVE ZCUSNO OF ZZFTO2-I TO CUSNO OF CUSFL3-RECORD
CBCUSTS 0875.00 MOVE ZCUSNO OF ZZFTO2-O TO CUSNO OF CUSTS-RECORD.
CBCUSTSD 0270.00 A ZCUSNO R B 19 22REFFLD(CUSNO XAN4CDEM,

The default View Level for 'Variable Where Used' option can be set using X-Analysis Preferences (General preferences) window.

As an example, let us test the View Levels for the field CUSNO.

Level 1: Level 1 lists all direct references to the CUSNO field.

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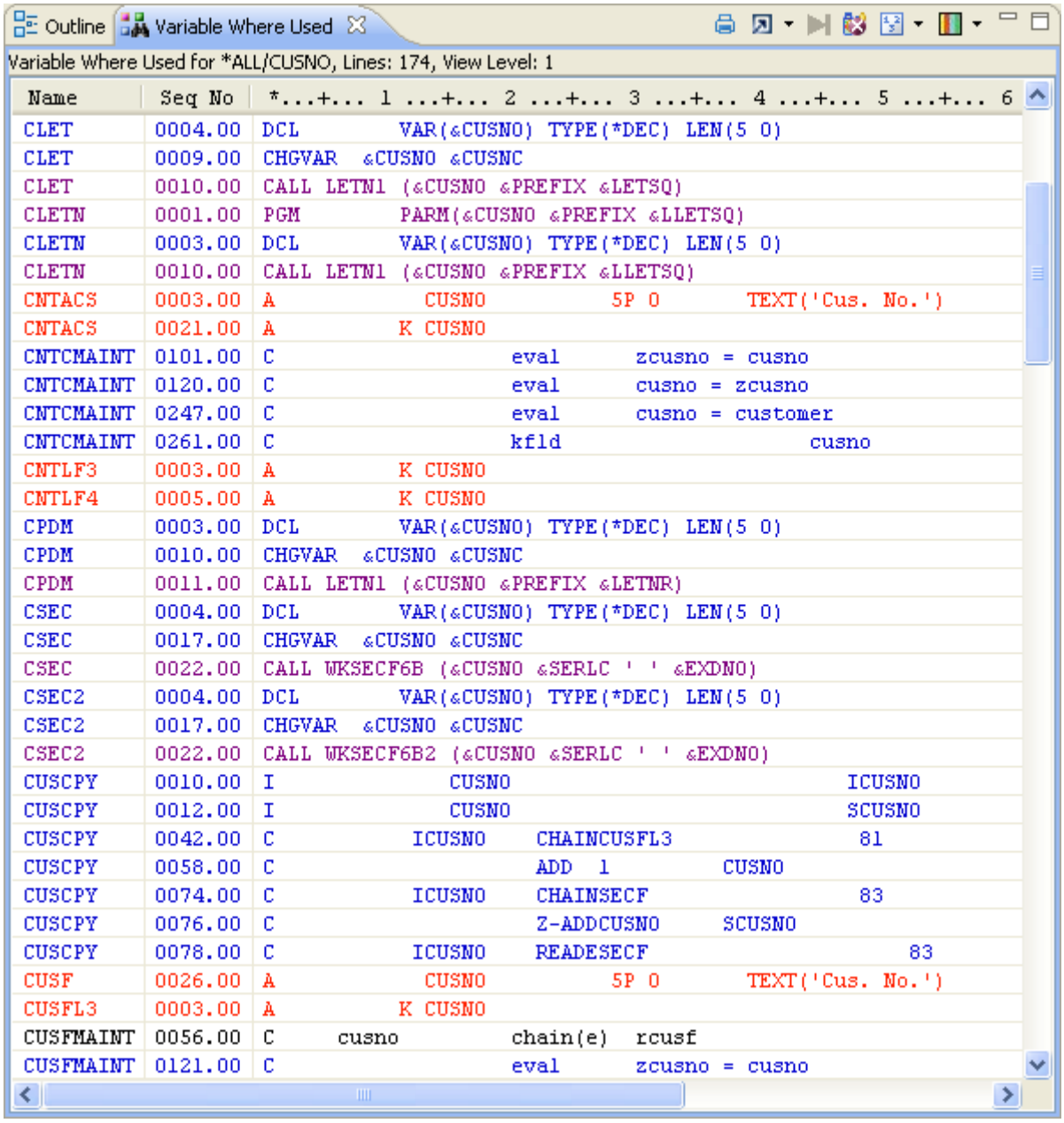
Variable Where Used - View Level 1



Name	Seq No	*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
CLET	0004.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CLET	0009.00	CHGVAR &CUSNO &CUSNC
CLET	0010.00	CALL LETN1 (&CUSNO &PREFIX &LETSQ)
CLETN	0001.00	PGM PARM(&CUSNO &PREFIX &LLETSQ)
CLETN	0003.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CLETN	0010.00	CALL LETN1 (&CUSNO &PREFIX &LLETSQ)
CNTACS	0003.00	A CUSNO 5P 0 TEXT('Cus. No.')
CNTACS	0021.00	A K CUSNO
CNTCMAINT	0101.00	C eval zcusno = cusno
CNTCMAINT	0120.00	C eval cusno = zcusno
CNTCMAINT	0247.00	C eval cusno = customer
CNTCMAINT	0261.00	C kfld cusno
CNTLF3	0003.00	A K CUSNO
CNTLF4	0005.00	A K CUSNO
CPDM	0003.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CPDM	0010.00	CHGVAR &CUSNO &CUSNC
CPDM	0011.00	CALL LETN1 (&CUSNO &PREFIX &LETNR)
CSEC	0004.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CSEC	0017.00	CHGVAR &CUSNO &CUSNC
CSEC	0022.00	CALL WKSECF6B (&CUSNO &SERLC ' ' &EXDNO)
CSEC2	0004.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CSEC2	0017.00	CHGVAR &CUSNO &CUSNC
CSEC2	0022.00	CALL WKSECF6B2 (&CUSNO &SERLC ' ' &EXDNO)
CUSCPY	0010.00	I CUSNO ICUSNO
CUSCPY	0012.00	I CUSNO SCUSNO
CUSCPY	0042.00	C ICUSNO CHAINCUSFL3 81
CUSCPY	0058.00	C ADD 1 CUSNO
CUSCPY	0074.00	C ICUSNO CHAINSECF 83
CUSCPY	0076.00	C Z-ADDCUSNO SCUSNO
CUSCPY	0078.00	C ICUSNO READESECF 83
CUSF	0026.00	A CUSNO 5P 0 TEXT('Cus. No.')
CUSFL3	0003.00	A K CUSNO
CUSFMAINT	0056.00	C cusno chain(e) rcusf
CUSFMAINT	0121.00	C eval zcusno = cusno

Level 2: Level 2 adds extra indirect references, “one reference removed,” to the Level 1 list. E.g., CUSTOMER is set equal to CUSNO (a direct reference) and then CUSTOMER is a variable in the statement “IF CUSTOMER = ZEROES” (a one reference removed indirect reference).

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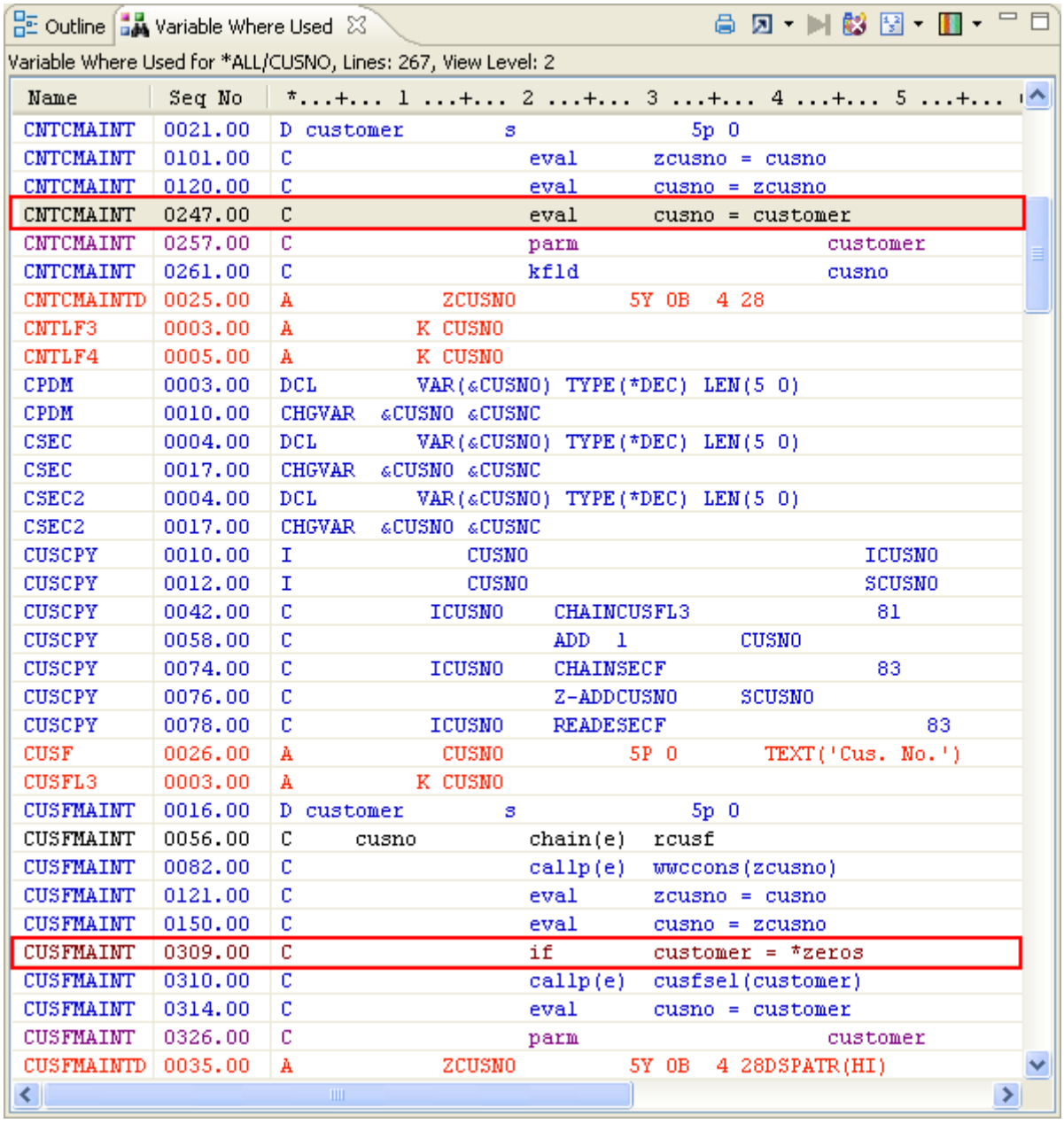
Variable Where Used - View Level 2



Name	Seq No	*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+...
CNTCMAINT	0021.00	D customer s 5p 0
CNTCMAINT	0101.00	C eval zcusno = cusno
CNTCMAINT	0120.00	C eval cusno = zcusno
CNTCMAINT	0247.00	C eval cusno = customer
CNTCMAINT	0257.00	C parm customer
CNTCMAINT	0261.00	C kfld cusno
CNTCMAINTD	0025.00	A ZCUSNO 5Y 0B 4 28
CNTLF3	0003.00	A K CUSNO
CNTLF4	0005.00	A K CUSNO
CPDM	0003.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CPDM	0010.00	CHGVAR &CUSNO &CUSNC
CSEC	0004.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CSEC	0017.00	CHGVAR &CUSNO &CUSNC
CSEC2	0004.00	DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CSEC2	0017.00	CHGVAR &CUSNO &CUSNC
CUSCPY	0010.00	I CUSNO ICUSNO
CUSCPY	0012.00	I CUSNO SCUSNO
CUSCPY	0042.00	C ICUSNO CHAINCUSFL3 81
CUSCPY	0058.00	C ADD 1 CUSNO
CUSCPY	0074.00	C ICUSNO CHAINSECF 83
CUSCPY	0076.00	C Z-ADDCUSNO SCUSNO
CUSCPY	0078.00	C ICUSNO READESECF 83
CUSF	0026.00	A CUSNO 5P 0 TEXT('Cus. No.')
CUSFL3	0003.00	A K CUSNO
CUSFMAINT	0016.00	D customer s 5p 0
CUSFMAINT	0056.00	C cusno chain(e) rcusf
CUSFMAINT	0082.00	C callp(e) wwccons(zcusno)
CUSFMAINT	0121.00	C eval zcusno = cusno
CUSFMAINT	0150.00	C eval cusno = zcusno
CUSFMAINT	0309.00	C if customer = *zeros
CUSFMAINT	0310.00	C callp(e) cusfsel(customer)
CUSFMAINT	0314.00	C eval cusno = customer
CUSFMAINT	0326.00	C parm customer
CUSFMAINTD	0035.00	A ZCUSNO 5Y 0B 4 28DSPATR(HI)

Level 3: Level 3 builds on the Level 2 references, adding indirect references that are “one further reference removed.”

Level 4/Parameters: Level 4 further includes fields used as parameters. For example, in the statement “CALL LETN (&CUSNO &PREFIX &LETNR)”, CUSNO is a parameter to call LETN.

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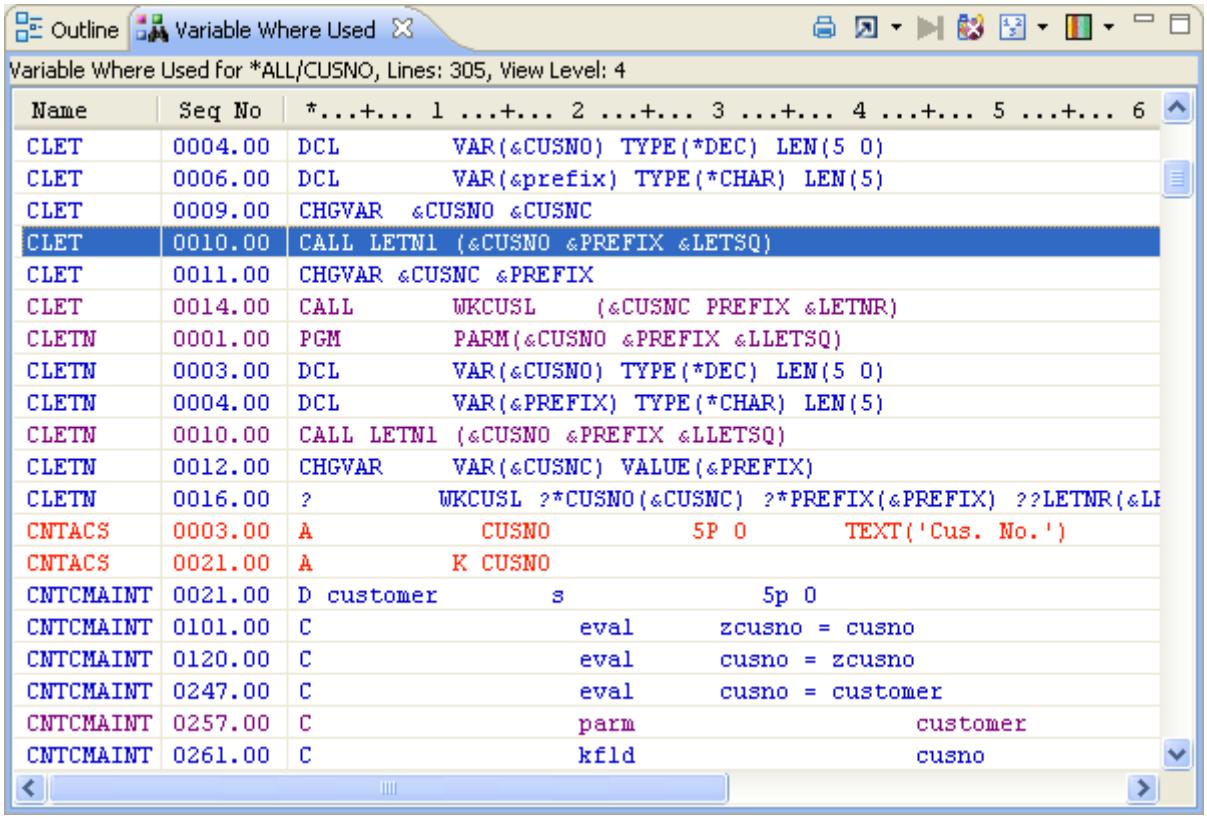
Variable Where Used - View Level 4


Outline
Variable Where Used
Variable Where Used for *ALL/CUSNO, Lines: 305, View Level: 4
Name Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
CLET 0004.00 DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CLET 0006.00 DCL VAR(&prefix) TYPE(*CHAR) LEN(5)
CLET 0009.00 CHGVAR &CUSNO &CUSNC
CLET 0010.00 CALL LETN1 (&CUSNO &PREFIX &LETSQ)
CLET 0011.00 CHGVAR &CUSNC &PREFIX
CLET 0014.00 CALL WKCUSL (&CUSNC PREFIX &LETNR)
CLETN 0001.00 PGM PARM(&CUSNO &PREFIX &LLETSQ)
CLETN 0003.00 DCL VAR(&CUSNO) TYPE(*DEC) LEN(5 0)
CLETN 0004.00 DCL VAR(&PREFIX) TYPE(*CHAR) LEN(5)
CLETN 0010.00 CALL LETN1 (&CUSNO &PREFIX &LLETSQ)
CLETN 0012.00 CHGVAR VAR(&CUSNC) VALUE(&PREFIX)
CLETN 0016.00 ? WKCUSL ?*CUSNO(&CUSNC) ?*PREFIX(&PREFIX) ??LETNR(&LE
CNTACS 0003.00 A CUSNO 5P 0 TEXT('Cus. No.')
CNTACS 0021.00 A K CUSNO
CNTCMAINT 0021.00 D customer s 5p 0
CNTCMAINT 0101.00 C eval zcusno = cusno
CNTCMAINT 0120.00 C eval cusno = zcusno
CNTCMAINT 0247.00 C eval cusno = customer
CNTCMAINT 0257.00 C parm customer
CNTCMAINT 0261.00 C kfld cusno

Level 5/Cascading Parameters: Extending the information in Level 4, Level 5 includes references where CUSNO fields are parameters in a function, called by another function.

Level 6/Aliases: Level 6 adds all references to any fields that are aliases to the CUSNO field.

Level 7/Maximum Tracking: Tracks the usage of a variable or a field to its maximum level of indirection.

This is the highest view level also referred as ‘Maximum Tracking’. This level displays ‘Variable Where Used’ information for all the levels mentioned above, as well as any other possible references of the field CUSNO.

The ‘Variable Where Used’ option can be opted over a large variety of items including:

Files, Array Definitions, Data Structures, Sub-Fields of a Data Structure, Indicators, Key Lists, Data Fields, File Formats, Subroutines, Program Variable, Array Elements, Parameter Lists, Parameters, Key Fields, Message Ids, EXCPT Names, etc.

Structure Chart Diagram / SCD

In order to interpret the application design, it is important to have some idea about how the control transfers from one program to the next. SCD addresses this need by presenting a graphical diagram, which contains relevant information as per control flow and call structure. In addition, you can view data input objects and avail a summarized description of each of the objects. Important functional aspects like updates, prints, and displays are colour-coded to help you quickly focus on these commonly preferred details.

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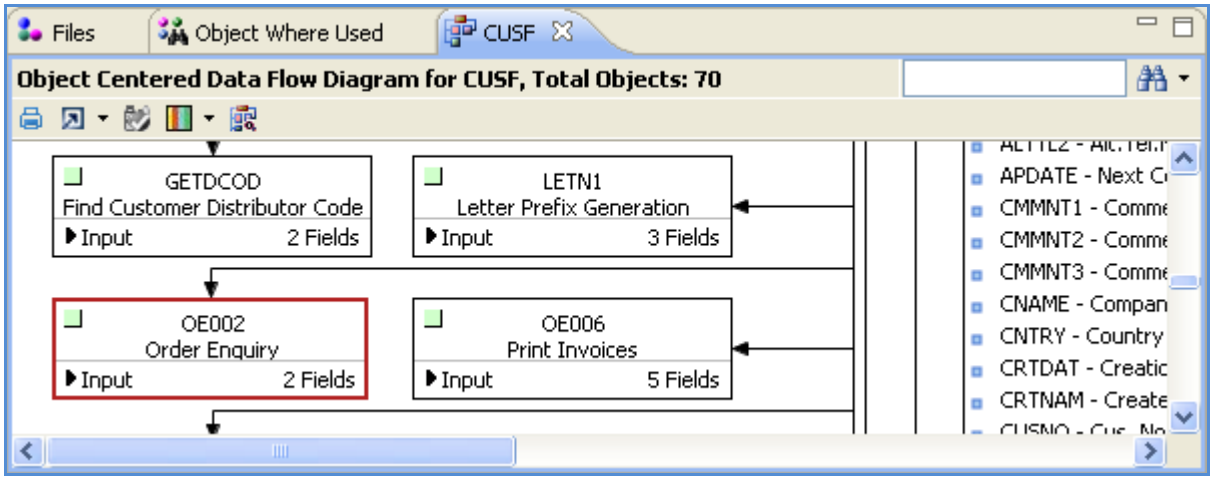
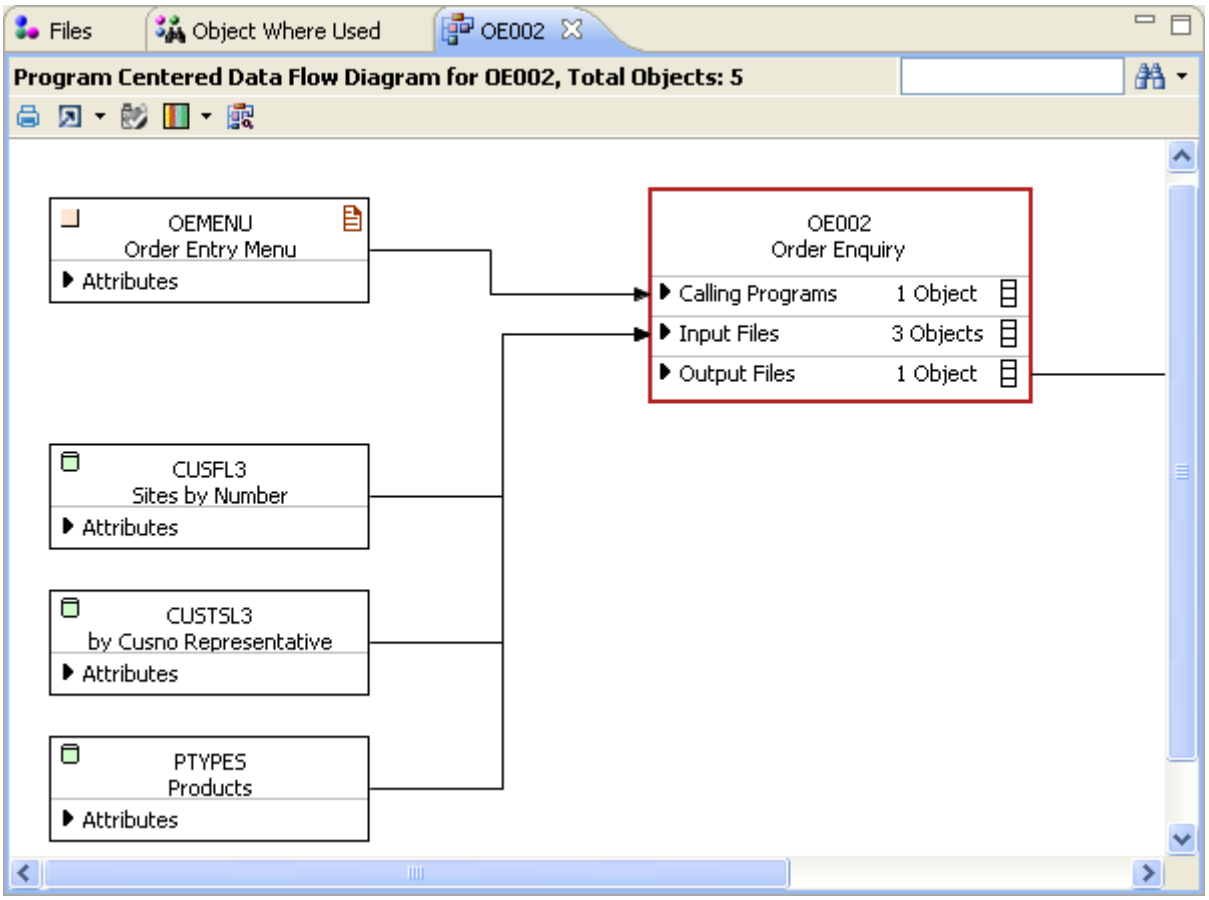
To create a Structure Chart diagram, first select the object OE002 from 'Data Flow Diagram' for CUSF.

Double click on an object to bring up DFD for that object



Double click on the object - **OE002,** to display its Data Flow Diagram.

Data Flow Diagram for OE002



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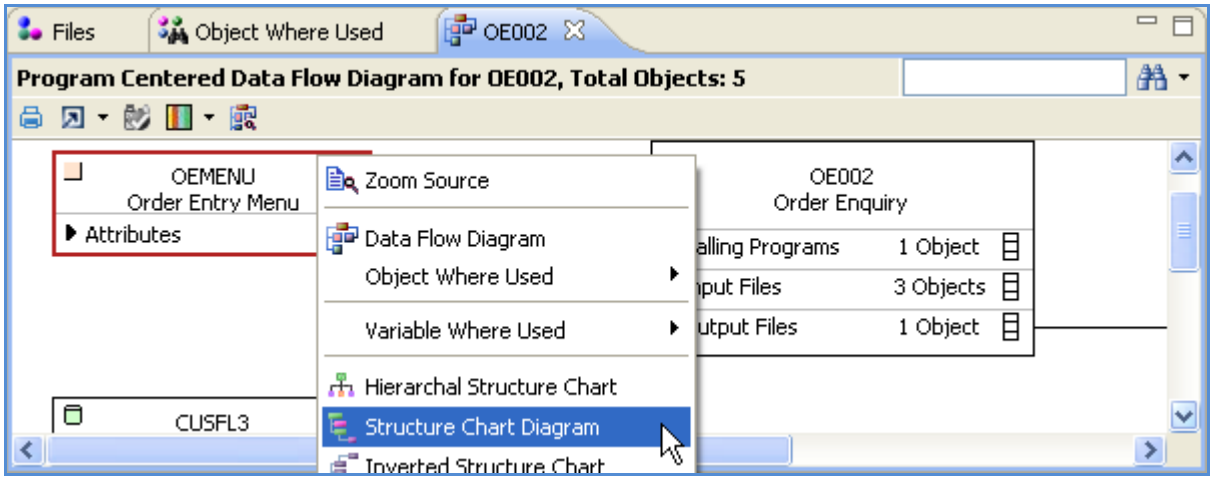
Select OEMENU and opt **Structure Chart Diagram** option from the context menu.

Context menu on DFD Object



The 'Structure Chart Diagram' is a nested tree diagram that displays the complete call hierarchy of programs called.

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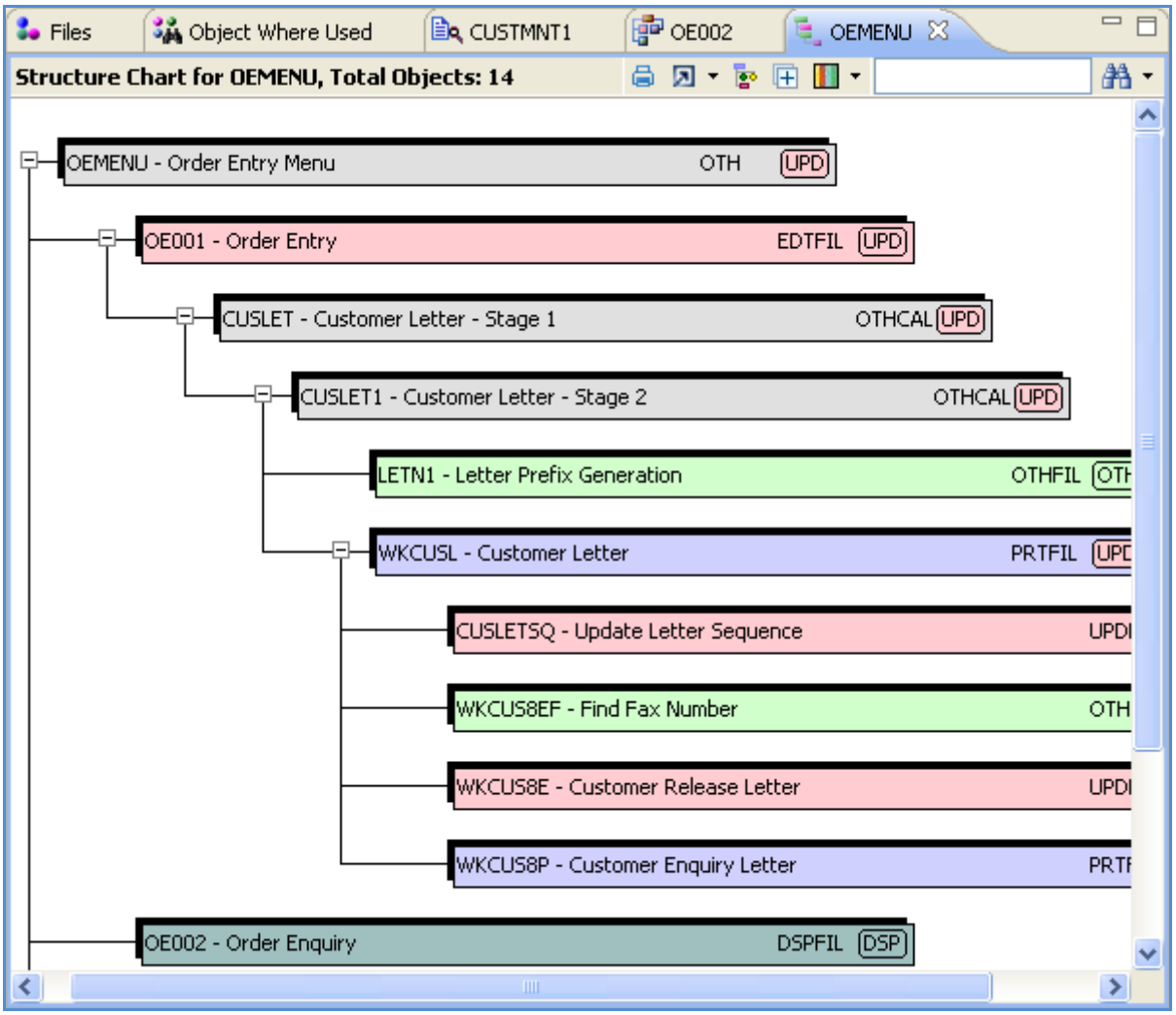
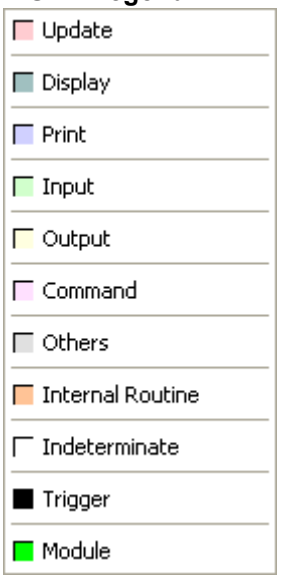
Structure Chart Diagram


Files
Object Where Used
CUSTMNT1
OE002
OEMENU
Structure Chart for OEMENU, Total Objects: 14
OEMENU - Order Entry Menu OTH UPD
OE001 - Order Entry EDTFIL UPD
CUSLET - Customer Letter - Stage 1 OTHCAL UPD
CUSLET1 - Customer Letter - Stage 2 OTHCAL UPD
LETN1 - Letter Prefix Generation OTHFIL
WKCUSL - Customer Letter PRTFIL
CUSLETSQ - Update Letter Sequence
WKCUS8EF - Find Fax Number OTH
WKCUS8E - Customer Release Letter
WKCUS8P - Customer Enquiry Letter
OE002 - Order Enquiry DSPFIL DSP

Now there is a normal view of a 'Structure Chart Diagram' (shown above). The 'Legend' button, available on the toolbar, helps to interpret different colours used in the Structure Chart Diagram.

SCD Legend



X-Analysis also allows annotation on the structure chart.

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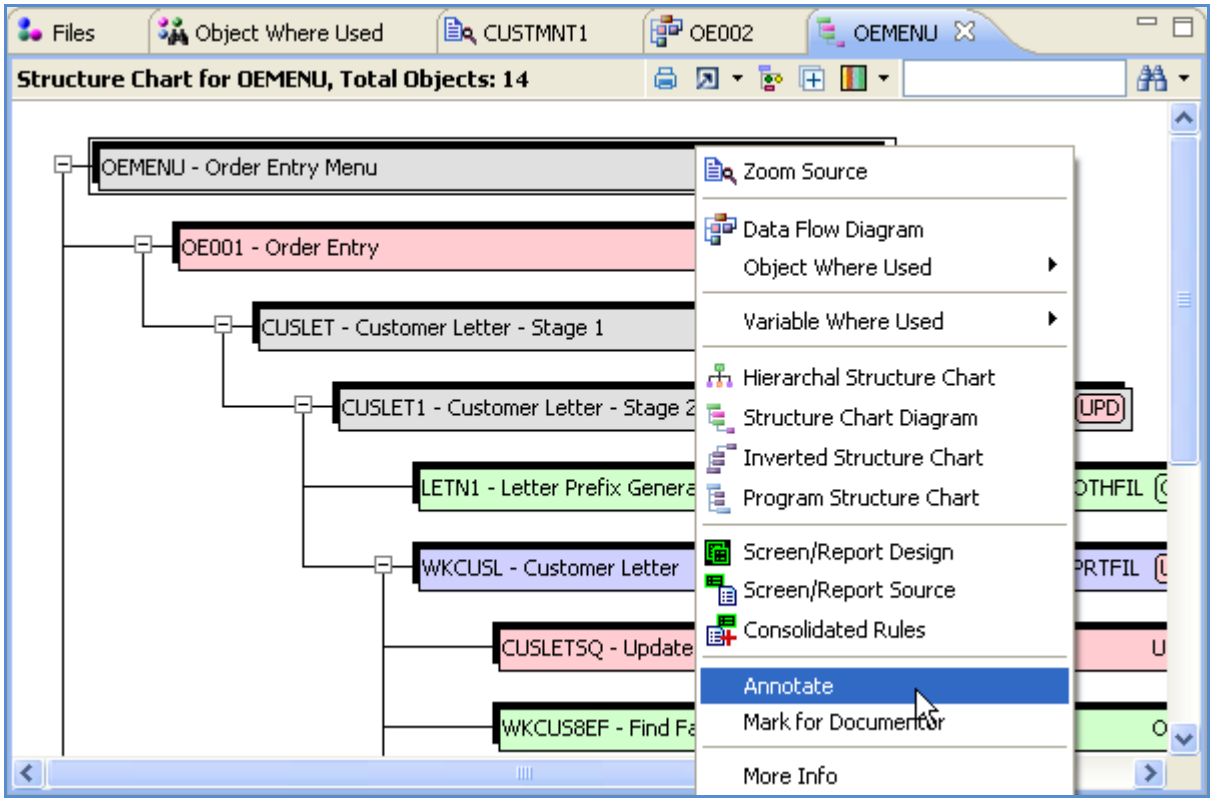
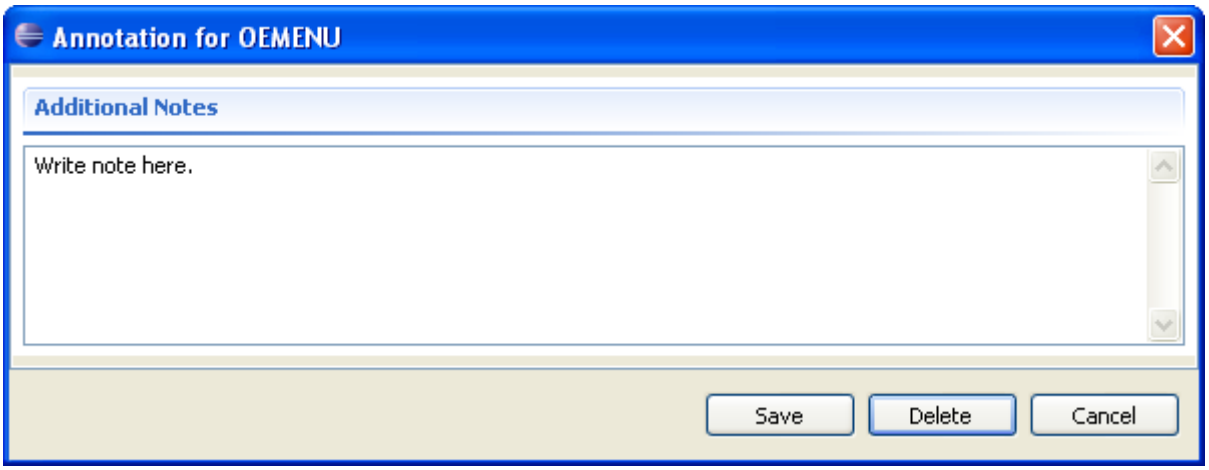
Select an object displayed in the Structure Chart Diagram and opt for **Annotate** option from the context menu.

The Annotate Option



This brings up the Annotation dialog. Write your note and click the **SAVE** button. The annotation is stored in a file available in the cross-reference library.

Annotation dialog for the object OEMENU



Re-generate the Structure Chart Diagram to check any object annotations.

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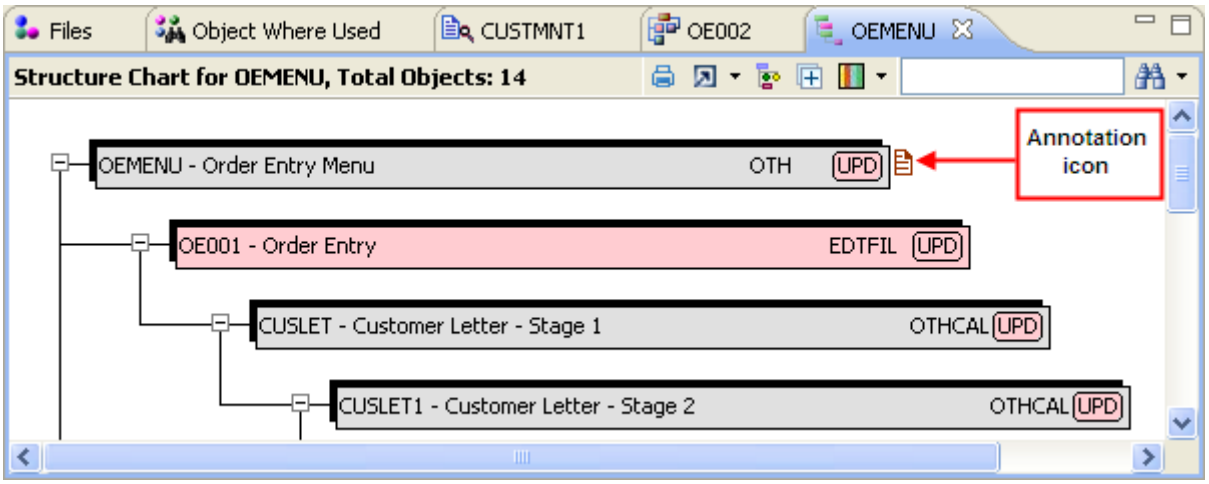
Annotation Icon for OEMENU in re-generated Structure Chart Diagram


Files
Object Where Used
CUSTMNT1
OE002
OEMENU
Structure Chart for OEMENU, Total Objects: 14
Annotation icon
OEMENU - Order Entry Menu OTH UPD
OE001 - Order Entry EDTFIL UPD
CUSLET - Customer Letter - Stage 1 OTHCAL UPD
CUSLET1 - Customer Letter - Stage 2 OTHCAL UPD

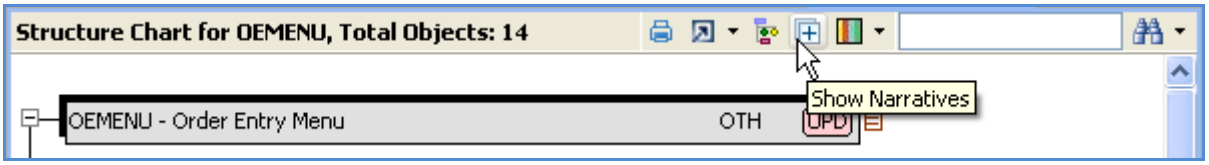
(Double click on the **Annotation Icon** to bring up the Annotation dialog).

Detailed Structure Chart

The 'Detailed Structure Chart' diagram displays files used by each program, together with each program's generated program text. (X-Analysis recovers the generated program text, which describes the purpose of the listed programs, automatically).

To generate the Detailed Structure Chart diagram, click the **Show Narratives** icon.

Show Narratives icon on toolbar



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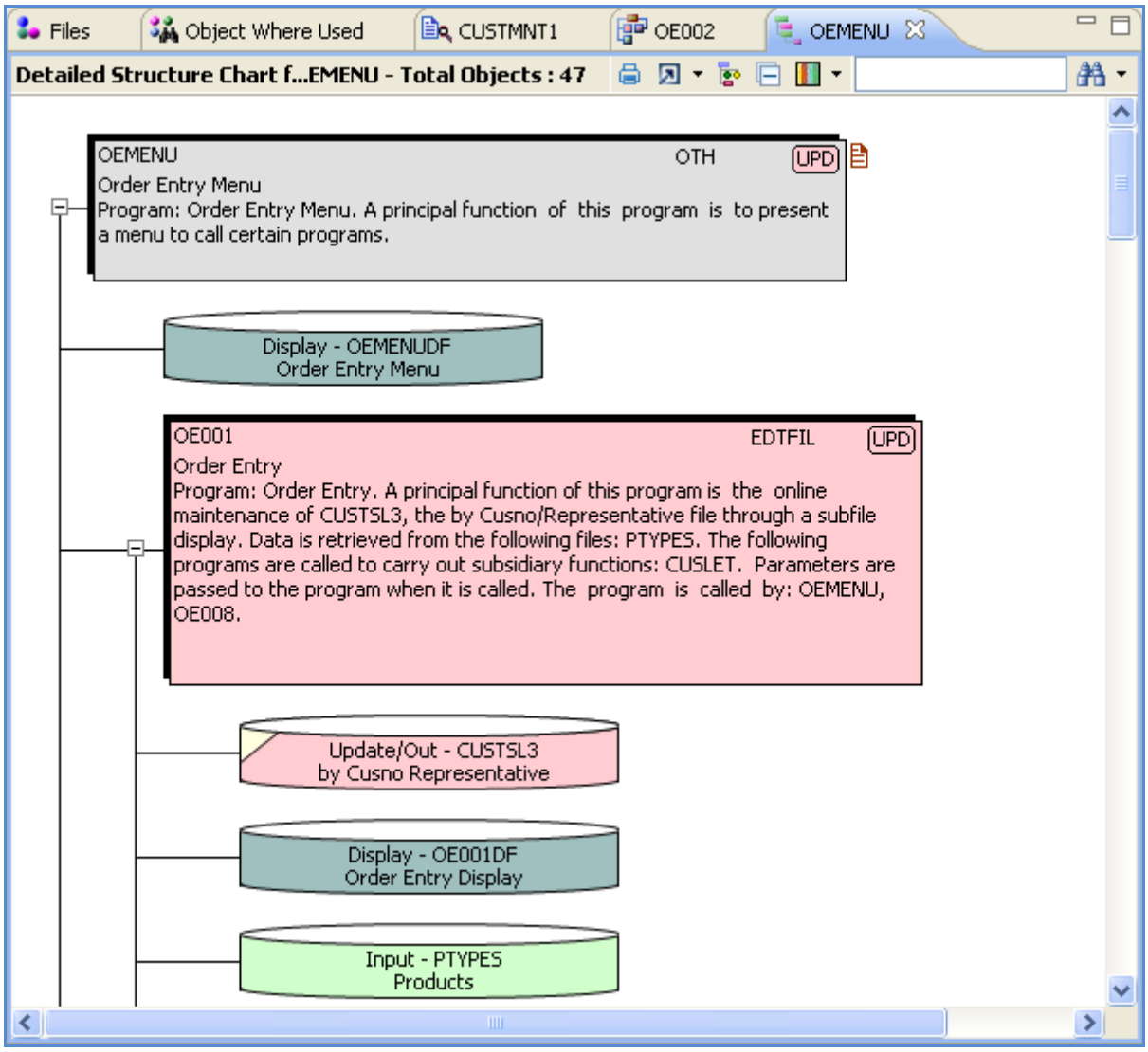
Detailed Structure Chart Diagram


Files
Object Where Used
CUSTMNT1
OE002
OEMENU
Detailed Structure Chart f...EMENU - Total Objects : 47
OEMENU
OTH
UPD
Order Entry Menu
Program: Order Entry Menu. A principal function of this program is to present a menu to call certain programs.
Display - OEMENUDF
Order Entry Menu
OE001
EDTFIL
UPD
Order Entry
Program: Order Entry. A principal function of this program is the online maintenance of CUSTSL3, the by Cusno/Representative file through a subfile display. Data is retrieved from the following files: PTYPES. The following programs are called to carry out subsidiary functions: CUSLET. Parameters are passed to the program when it is called. The program is called by: OEMENU, OE008.
Update/Out - CUSTSL3
by Cusno Representative
Display - OE001DF
Order Entry Display
Input - PTYPES
Products

Click the **Normal SCD** icon on the toolbar to switch back to the Normal Structure Chart Diagram.

Hierarchal Structure Chart

An upgrade on the Structure Chart Diagram, the Hierarchical Structure Chart offers a precise view of all the programs representing their control flow and call structure through neat, colour-coded bus routing block diagram. Select **Hierarchical Structure Chart** option from the context menu over **OEMENU** from Structure Chart Diagram, as shown below:

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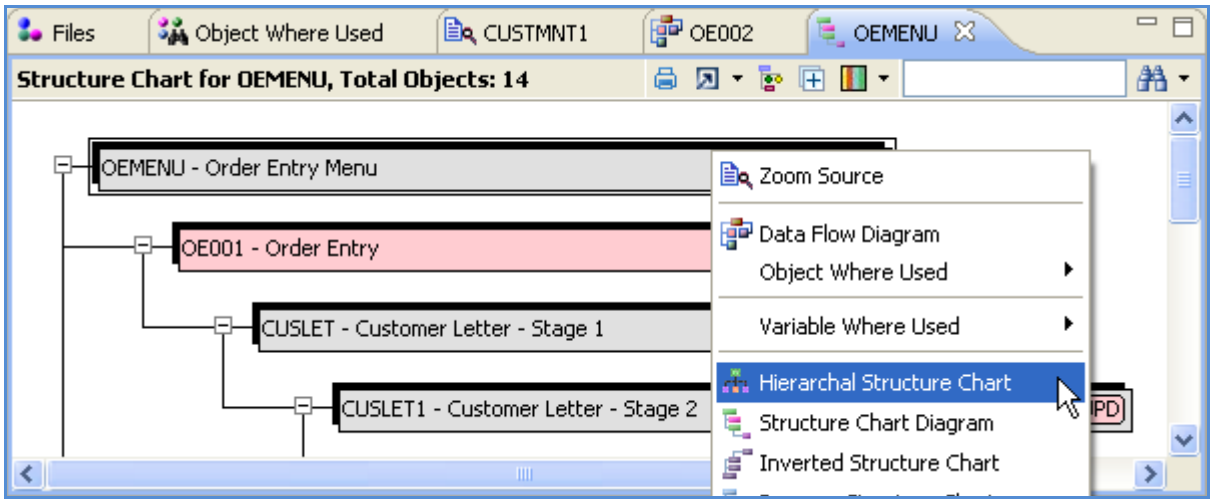
Hierarchal Structure Chart Option



In the display below, the OEMENU has been broken down into several blocks of related objects in call order. The colour codes indicate whether a particular object is command-based, or input-based or print-based and so on.

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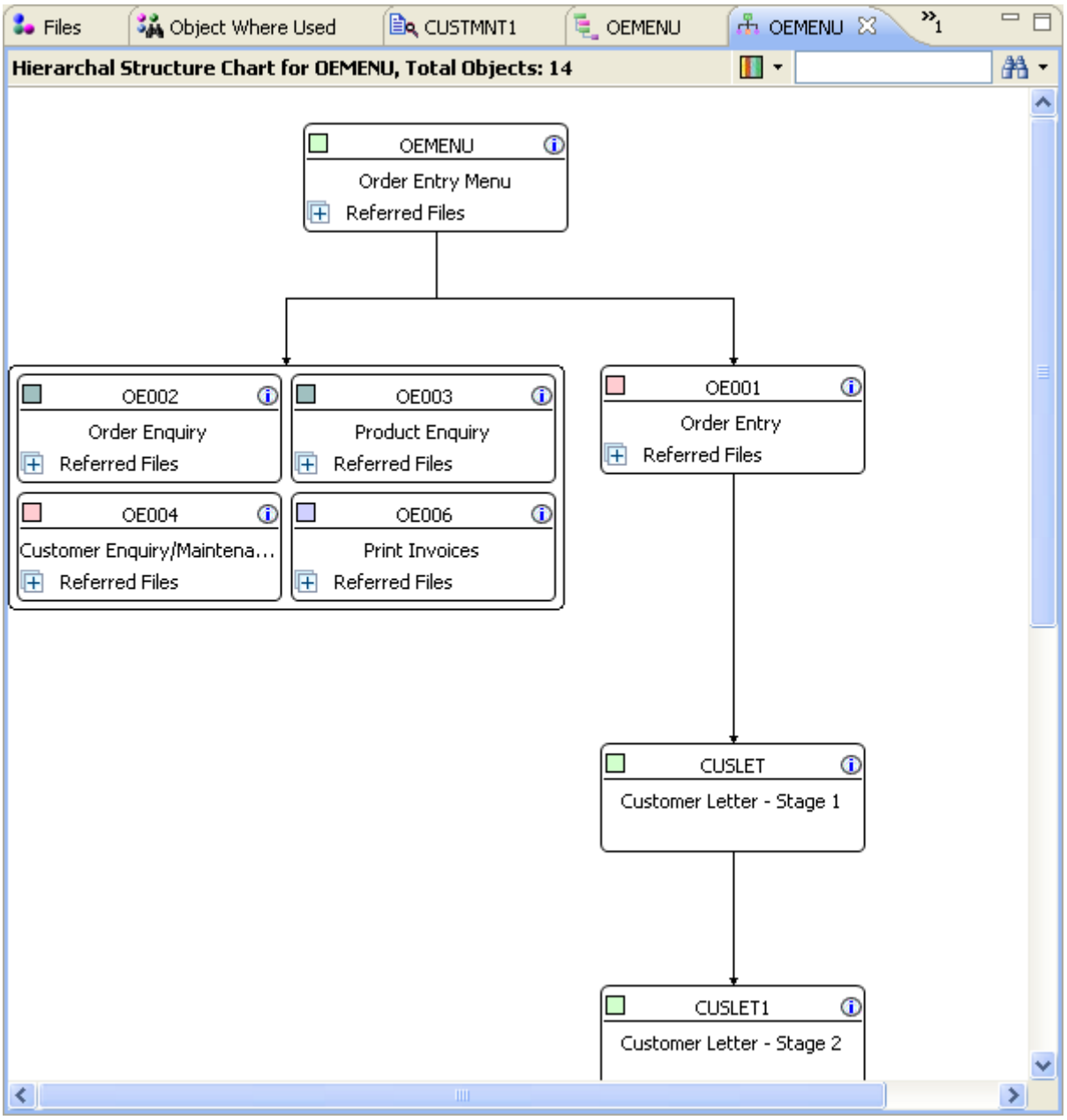
Hierarchical Structure Chart



Narration

User can avail of additional details regarding a specific object via the Narratives icon, as shown below:

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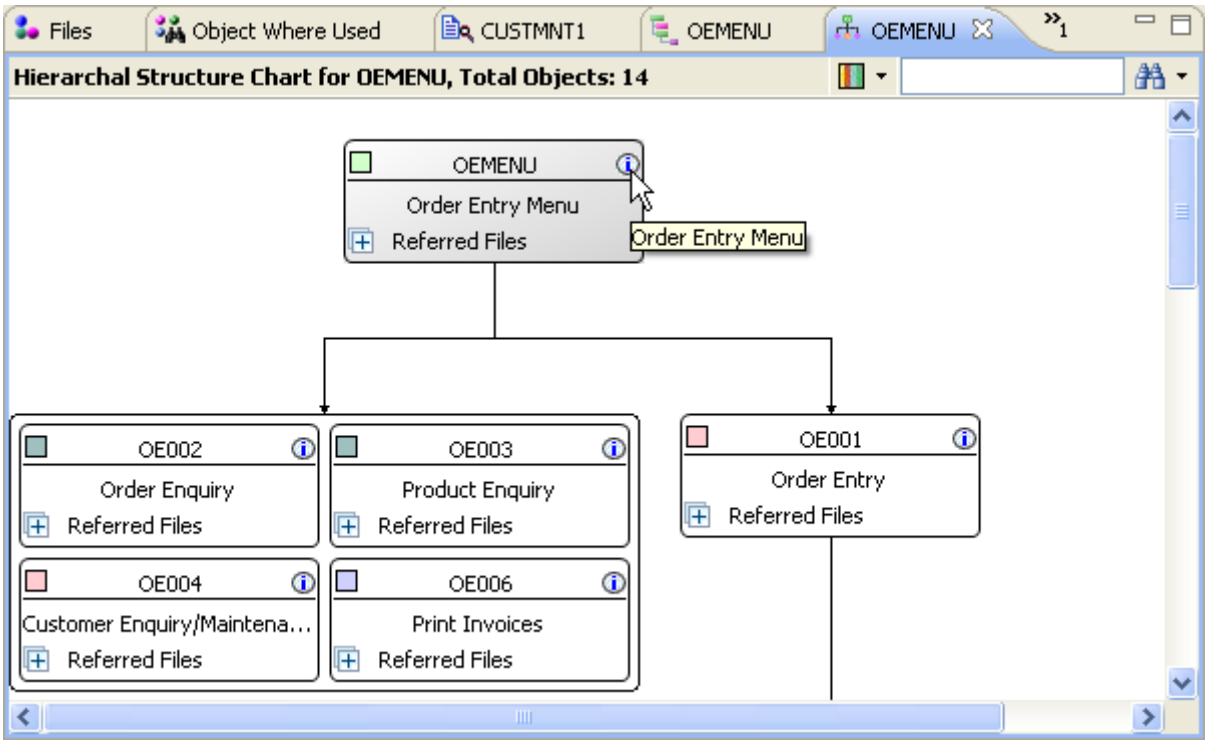
Narration Icon



When the user clicks on this, a pop-up window provides the auto-generated narration for the program, as shown below:

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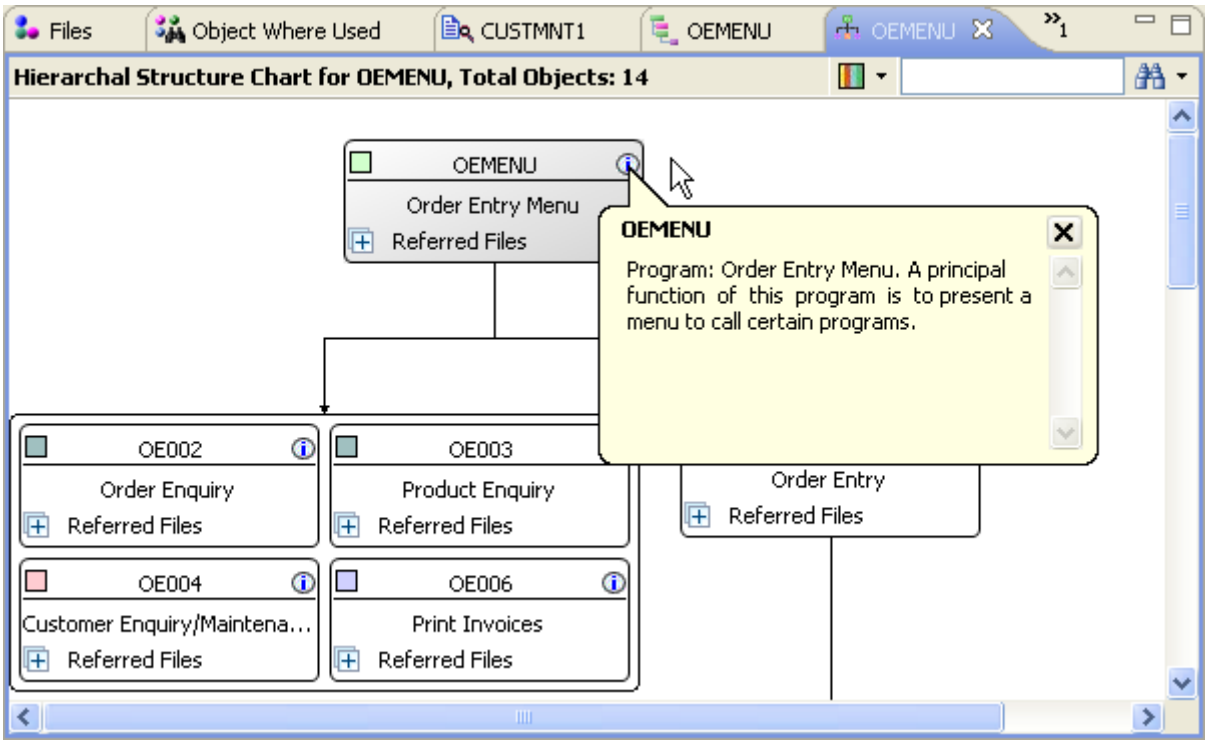
Narration Dialog Box



Referred Files

Hierarchical Structure Chart has a feature to display referred files inline. An expandable icon called 'Referred Files' is available in each box. Once user clicks on this, he gets to view all files belonging to that particular object.

See the following screenshot to view how a click on the icon preceding Referred Files, expands to display files referred to by the object OE001.

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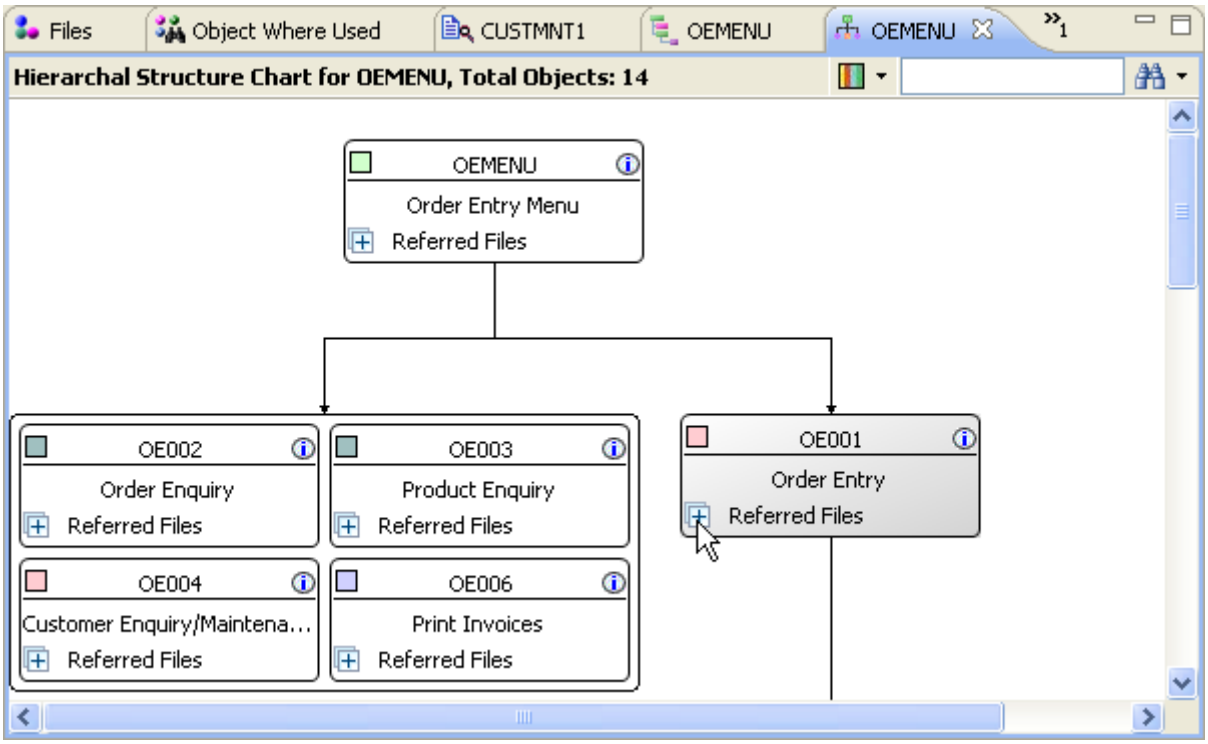
Referred File Icon



The following screenshot shows the 'Referred Files' of the object OE001. The colour coded geometric shape before the file name indicates type of file.

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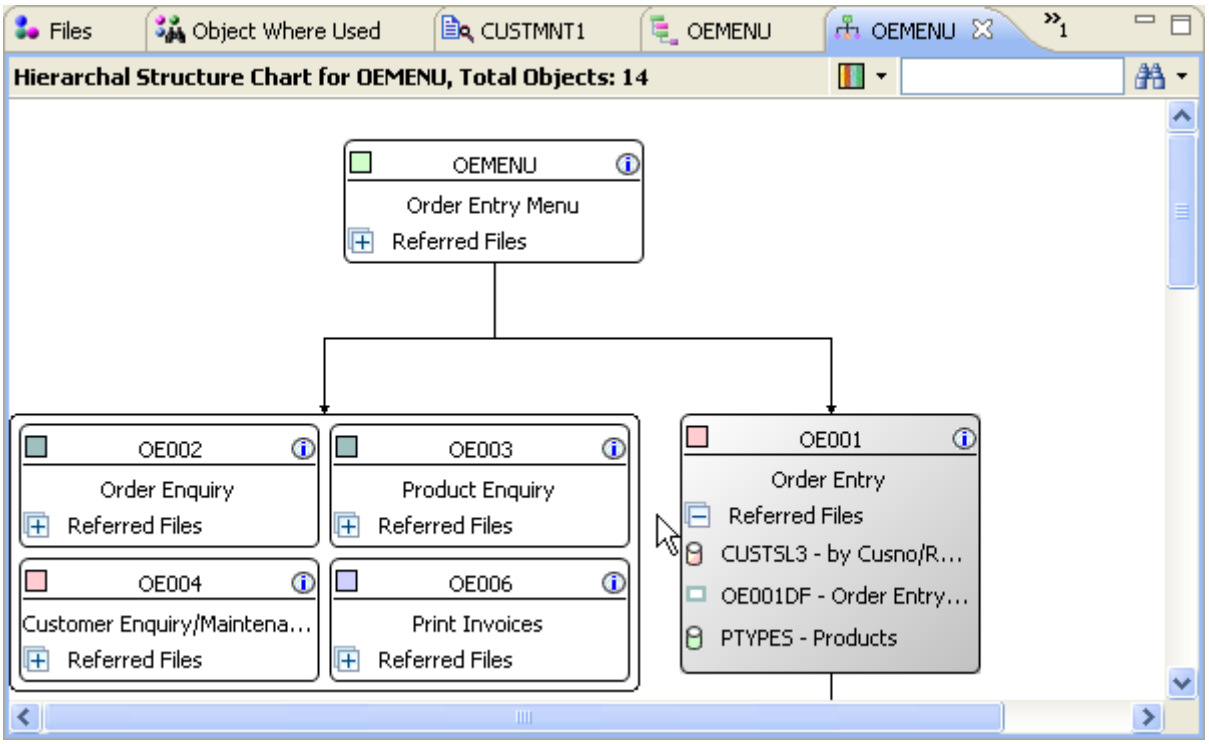
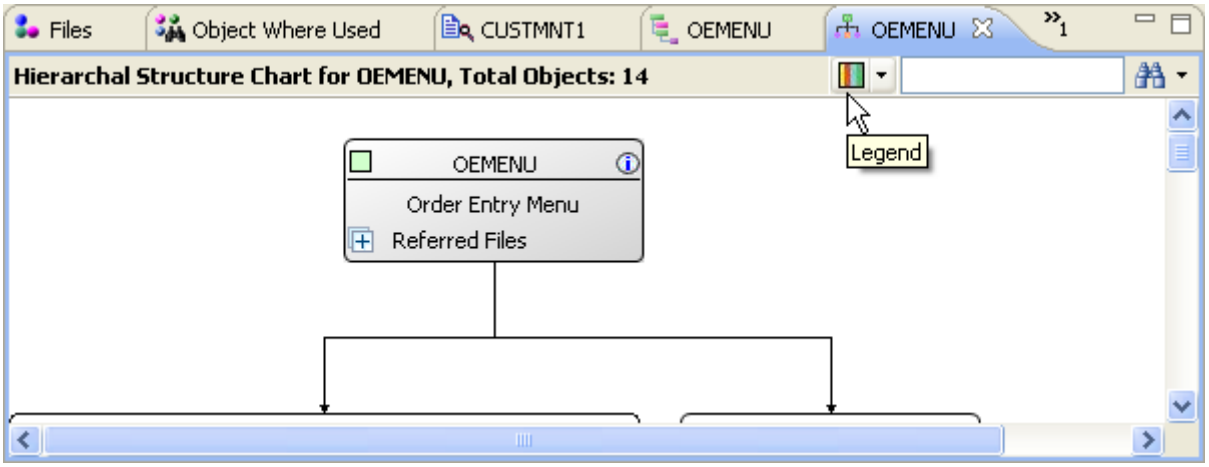
Referred Files - Expanded



Legend Icon

The Legend icon on the toolbar displays details of the colour scheme used by Hierarchical SCD. Click the Legend icon. As shown below:

Legend Icon



The Legend displays colour scheme, which helps user to understand the reference and association of specific objects.

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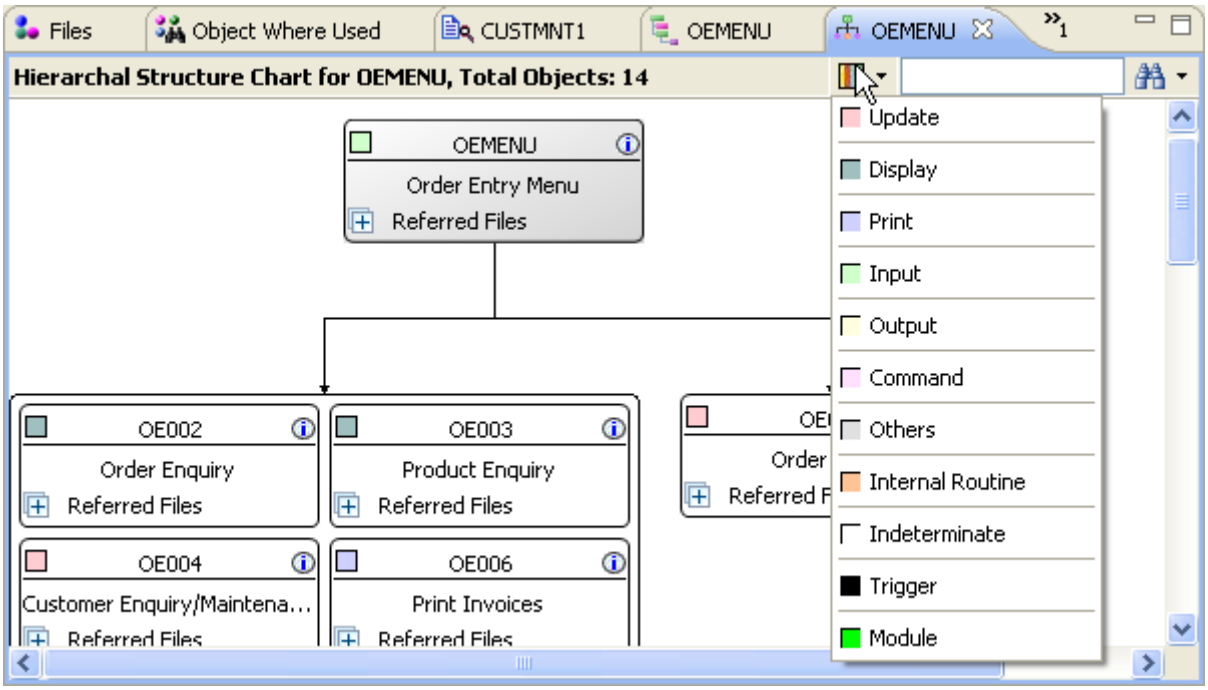
Legend Expanded



Document Manager

One of the most powerful functionalities of X-Analysis is the ability to generate structured documentation automatically. The inbuilt document manager facilitates the generation of PDF / MS Word document containing the system design information for specified objects.

First, Objects have to be marked for documentation. Select option **Mark for Documenter** from the context menu over OEMENU.

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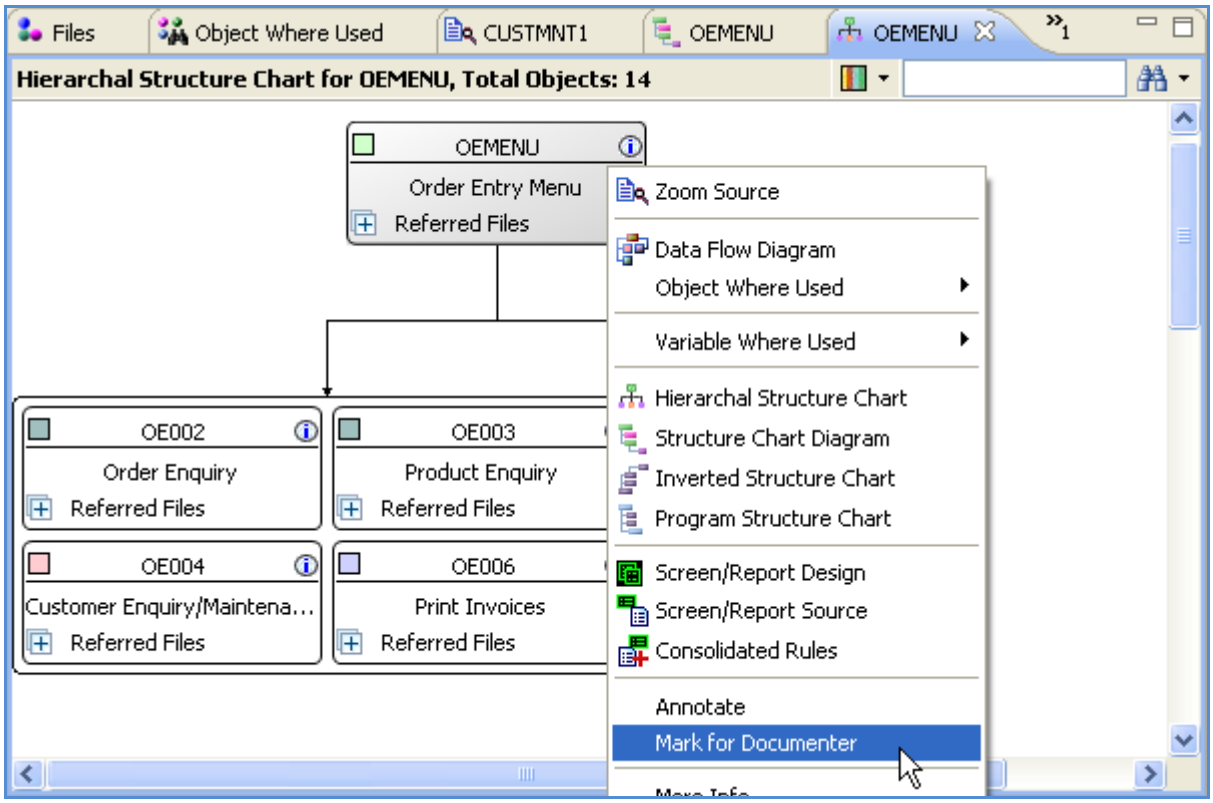
Mark an Object for Documentation



X-Analysis provides **Mark all for Documenter** option under the X-Analysis menu. This flags all objects displayed in the diagram.

X-Analysis Menu

The 'Mark all for Documenter' option is available for all diagrams and lists.

Next, navigate back to the object list window using the back arrow, available on the eclipse toolbar, and select the object CUSF.

Select **Mark for Documenter** option from the context menu on the object CUSF.

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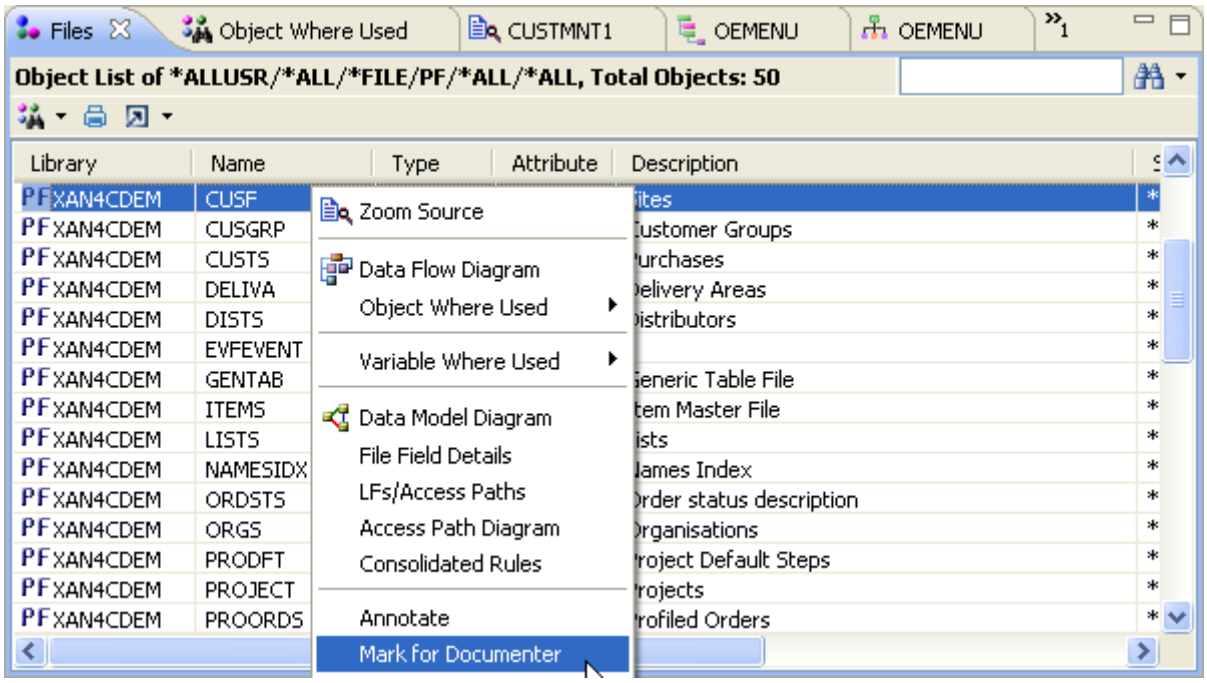
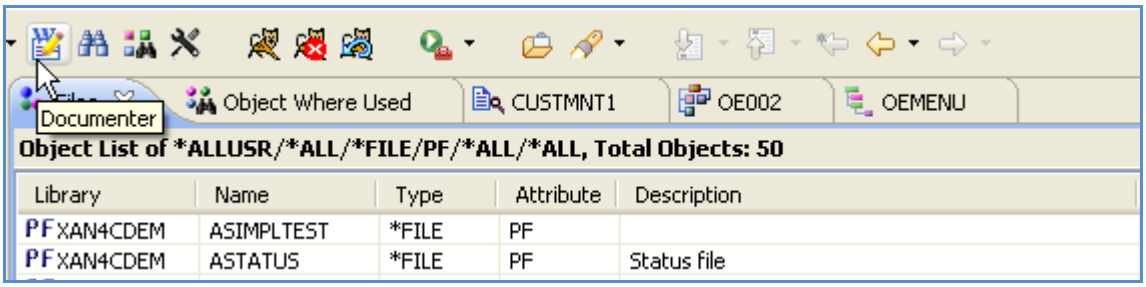
Mark for Documenter Option – Context Menu on CUSF



To start the documentation process, click the **Documenter** icon available on the toolbar.

Documenter icon on toolbar



This invokes the **Document Manager** dialog.

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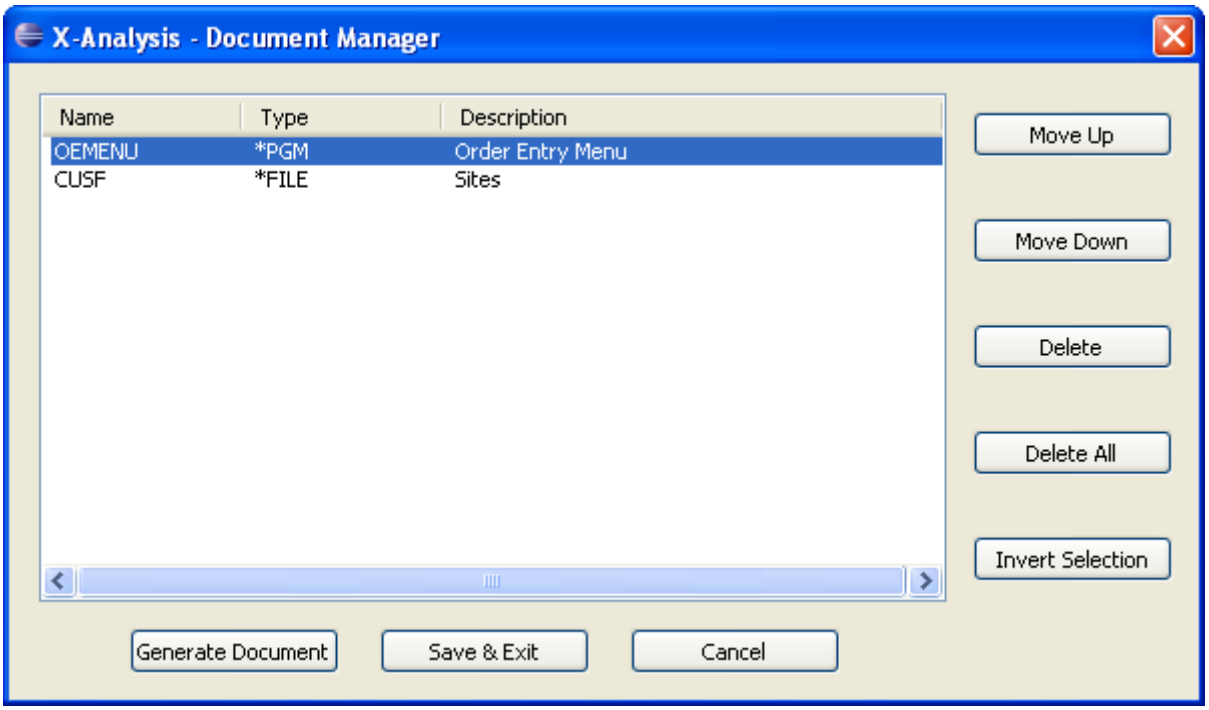
X-Analysis Document Manager



The ‘Document Manager’ dialog lists all the marked objects for documentation. Use the 'Move Up' / 'Move Down' / 'Delete' / 'Delete All' buttons to organise Objects/Members on the documenter list.

The ‘Invert Selection’ button on the Document Manager dialog unselects the selected objects and selects all the un-selected objects.

After having organised the listed objects, click the **Generate Document** button. This invokes a Documenter Wizard.

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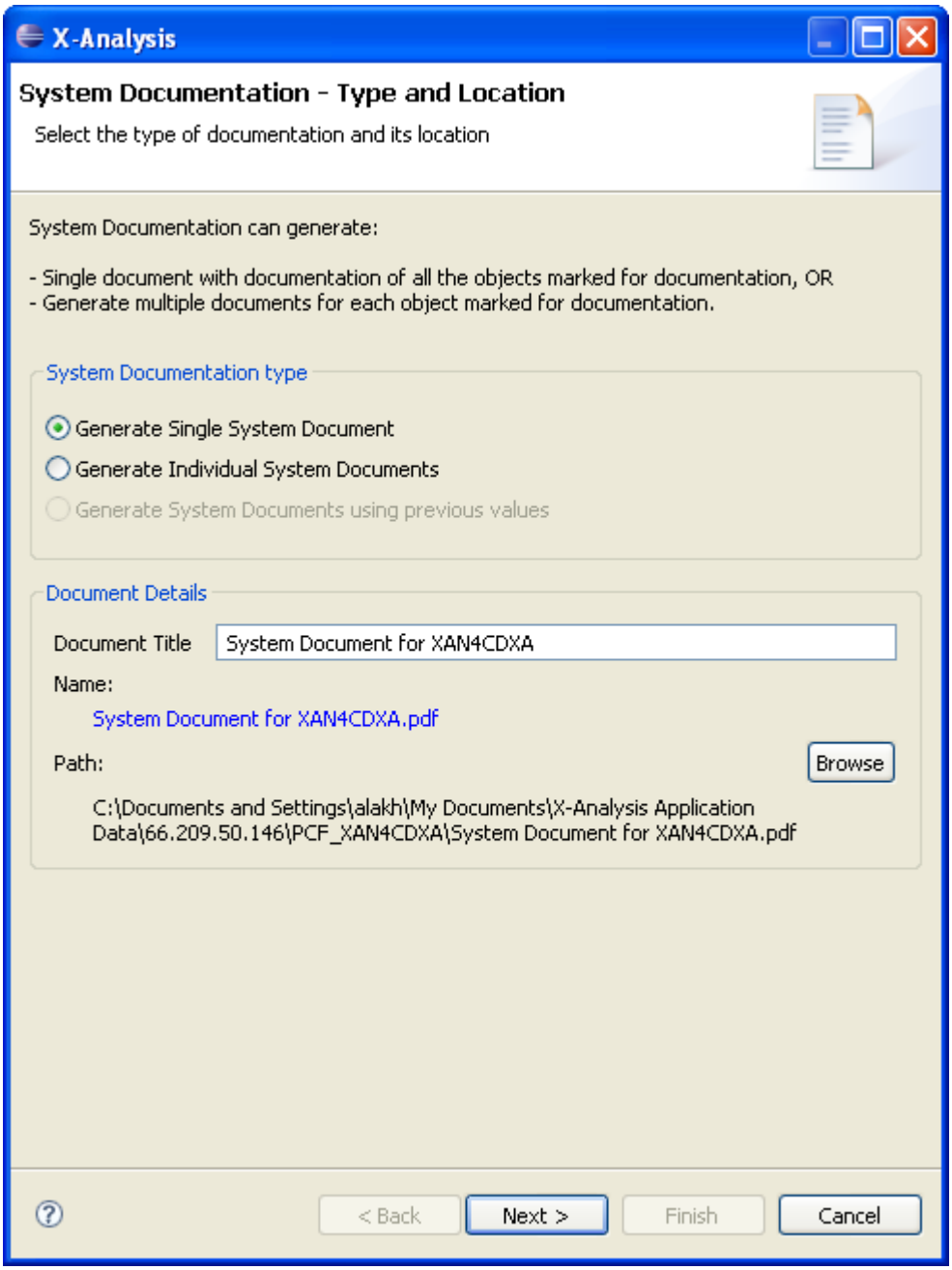
System Documentation Wizard – Type and Location


X-Analysis
System Documentation - Type and Location
Select the type of documentation and its location
System Documentation can generate:
- Single document with documentation of all the objects marked for documentation, OR
- Generate multiple documents for each object marked for documentation.
System Documentation type
Generate Single System Document
Generate Individual System Documents
Generate System Documents using previous values
Document Details
Document Title
System Document for XAN4CDXA
Name:
System Document for XAN4CDXA.pdf
Path:
Browse
C:\Documents and Settings\alakh\My Documents\X-Analysis Application Data\66.209.50.146\PCF_XAN4CDXA\System Document for XAN4CDXA.pdf
< Back
Next >
Finish
Cancel

The 'Type and Location' dialog consists of two sections:

- System Documentation Type
- Document Details

The System Documentation Type section provides facilities to generate the following types of documents:

- **Generate Single System Document:** Generates a single PDF/MS Word document.

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- **Generate Individual System Document:** Generates a PDF/MS Word document for each object.
- **Generate System Documents Using Previous Values:** Generates system documentation using the options selected in previous instance of system documentation. (This option is only available for generated system documents).

Select **Generate Single System Document** option.

The **Document Details** section specifies the document title, generated system document name, and its location. A user can specify a different file name for the generated PDF/MS Word document and a different location to save the generated document.

Click the **Next** button.

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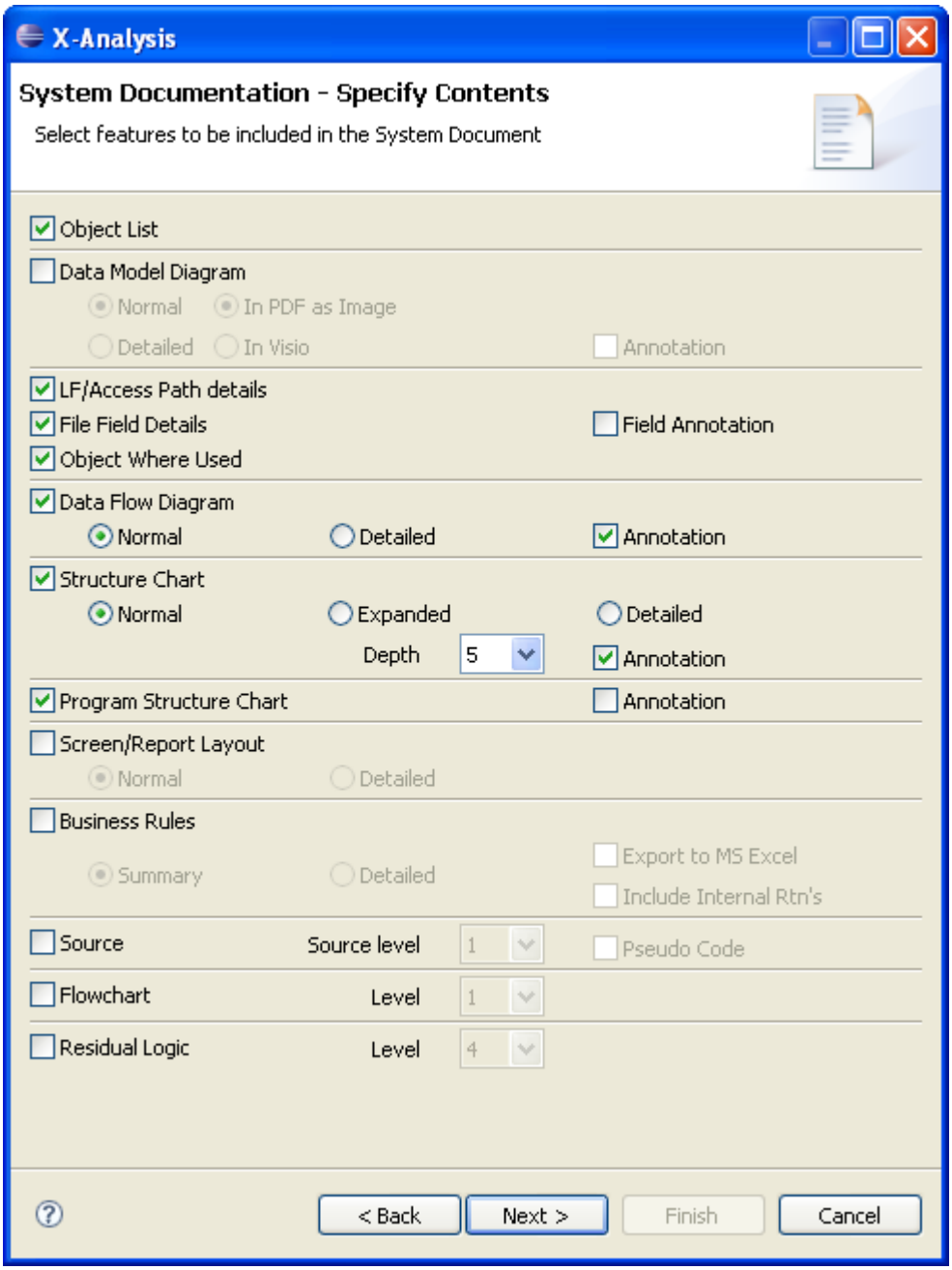
System Documentation Wizard – Specify Contents



This System Documentation Wizard dialog allows a user to choose various features/attributes to be included in system document. Select the features/attributes as shown above.

Click the **Next** button.

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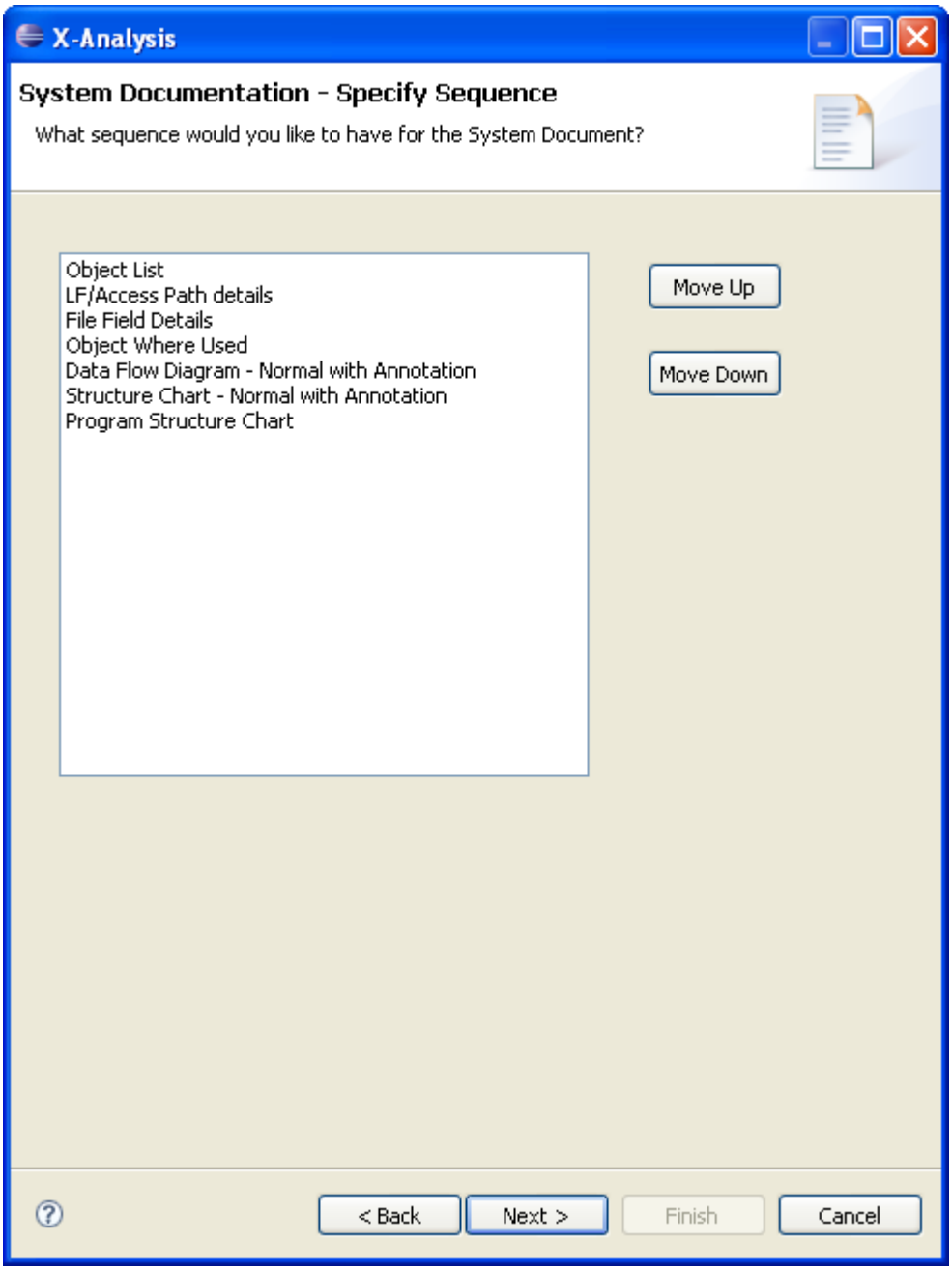
System Documentation Wizard – Specify Sequence



Confirm the sequence of the features / attributes selected for system documentation.

Click the **Next** button.

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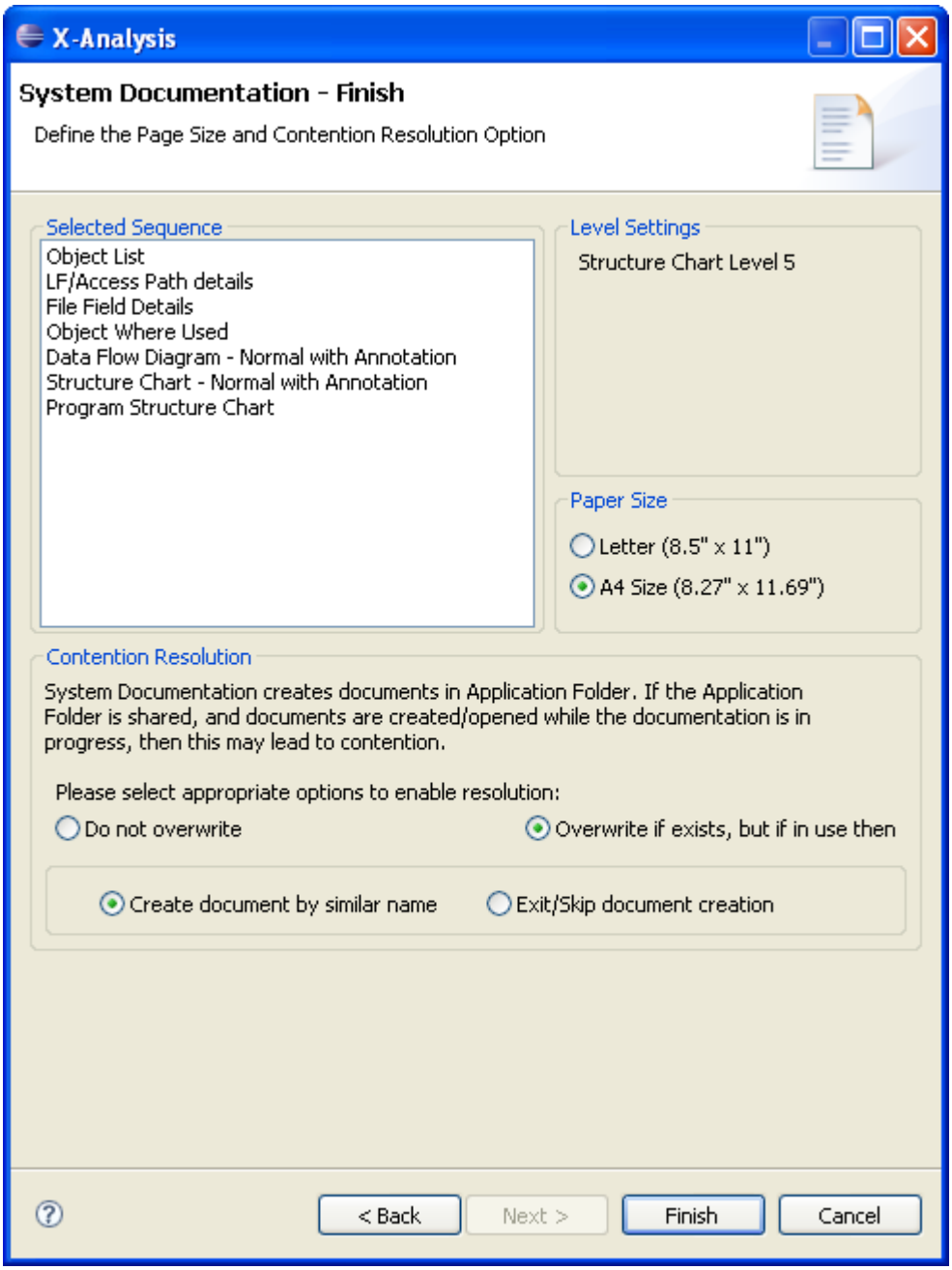
System Documentation Wizard – Finish


X-Analysis
System Documentation - Finish
Define the Page Size and Contention Resolution Option
Selected Sequence
Object List
LF/Access Path details
File Field Details
Object Where Used
Data Flow Diagram - Normal with Annotation
Structure Chart - Normal with Annotation
Program Structure Chart
Level Settings
Structure Chart Level 5
Paper Size
Letter (8.5" x 11")
A4 Size (8.27" x 11.69")
Contention Resolution
System Documentation creates documents in Application Folder. If the Application Folder is shared, and documents are created/opened while the documentation is in progress, then this may lead to contention.
Please select appropriate options to enable resolution:
Do not overwrite
Overwrite if exists, but if in use then
Create document by similar name
Exit/Skip document creation
< Back
Next >
Finish
Cancel

Select the required formatting options available to generate a system document. Click the **Finish** button to end configuring the system document contents and start the document generation.

After the system document generation, there is the following dialog:

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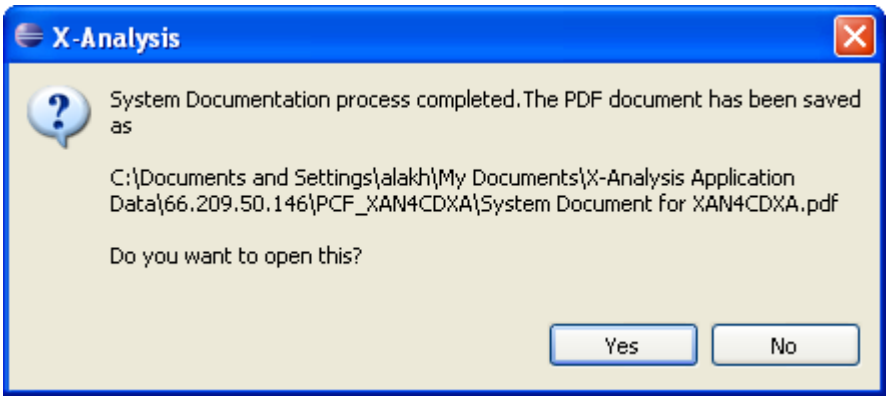
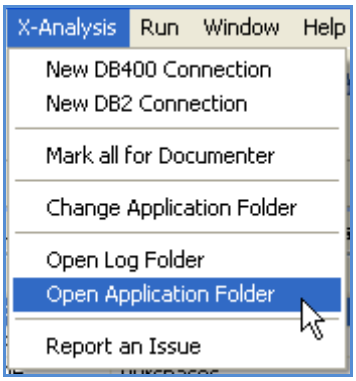
System Documentation Completion Dialog


X-Analysis
System Documentation process completed.The PDF document has been saved as
C:\Documents and Settings\alakh\My Documents\X-Analysis Application Data\66.209.50.146\PCF_XAN4CDXA\System Document for XAN4CDXA.pdf
Do you want to open this?
Yes
No

Click the **Yes** button to open the generated document.

A User can also view a previously generated document. To open a generated document, opt for **Open Application Folder** option from the X-Analysis menu.

Open Application folder option



This invokes - Application Folder - containing generated system documents. Double click on a generated document to open it.

X-Analysis also creates a log file under 'Application Folder'. It logs what the 'Document Generator' does in the process of documenting selected objects.

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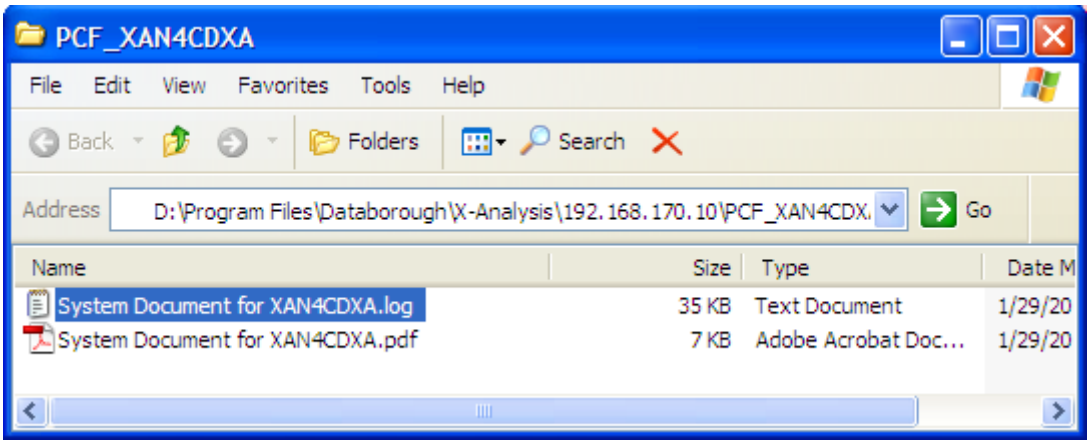
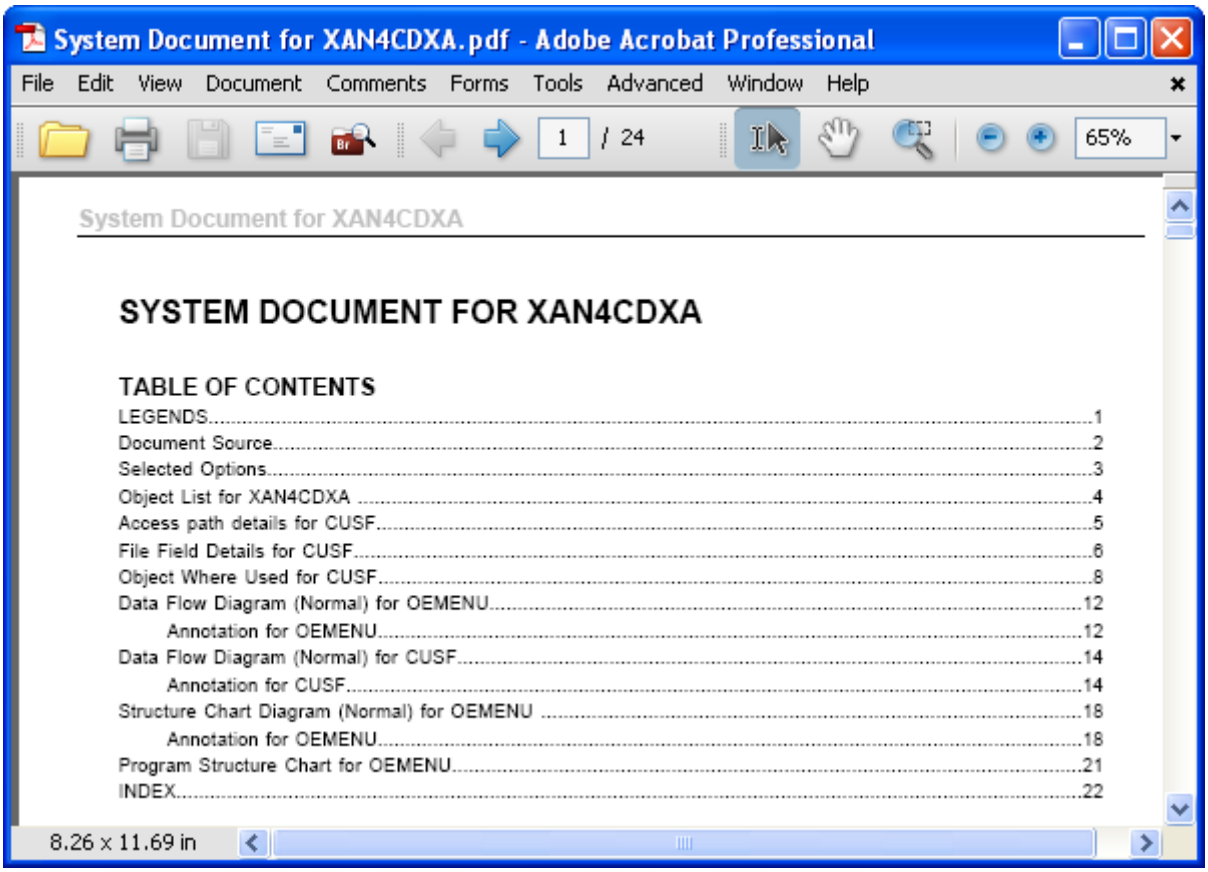
Application Folder containing generated document


PCF_XAN4CDXA
File Edit View Favorites Tools Help
Back Folders Search
Address D:\Program Files\Databorough\X-Analysis\192.168.170.10\PCF_XAN4CDX
Go
Name Size Type Date M
System Document for XAN4CDXA.log 35 KB Text Document 1/29/20
System Document for XAN4CDXA.pdf 7 KB Adobe Acrobat Doc... 1/29/20

System document - TOC


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
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System Document for XAN4CDXA
SYSTEM DOCUMENT FOR XAN4CDXA
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Annotation for CUSF....14
Structure Chart Diagram (Normal) for OEMENU....18
Annotation for OEMENU....18
Program Structure Chart for OEMENU....21
INDEX....22
8.26 x 11.69 in

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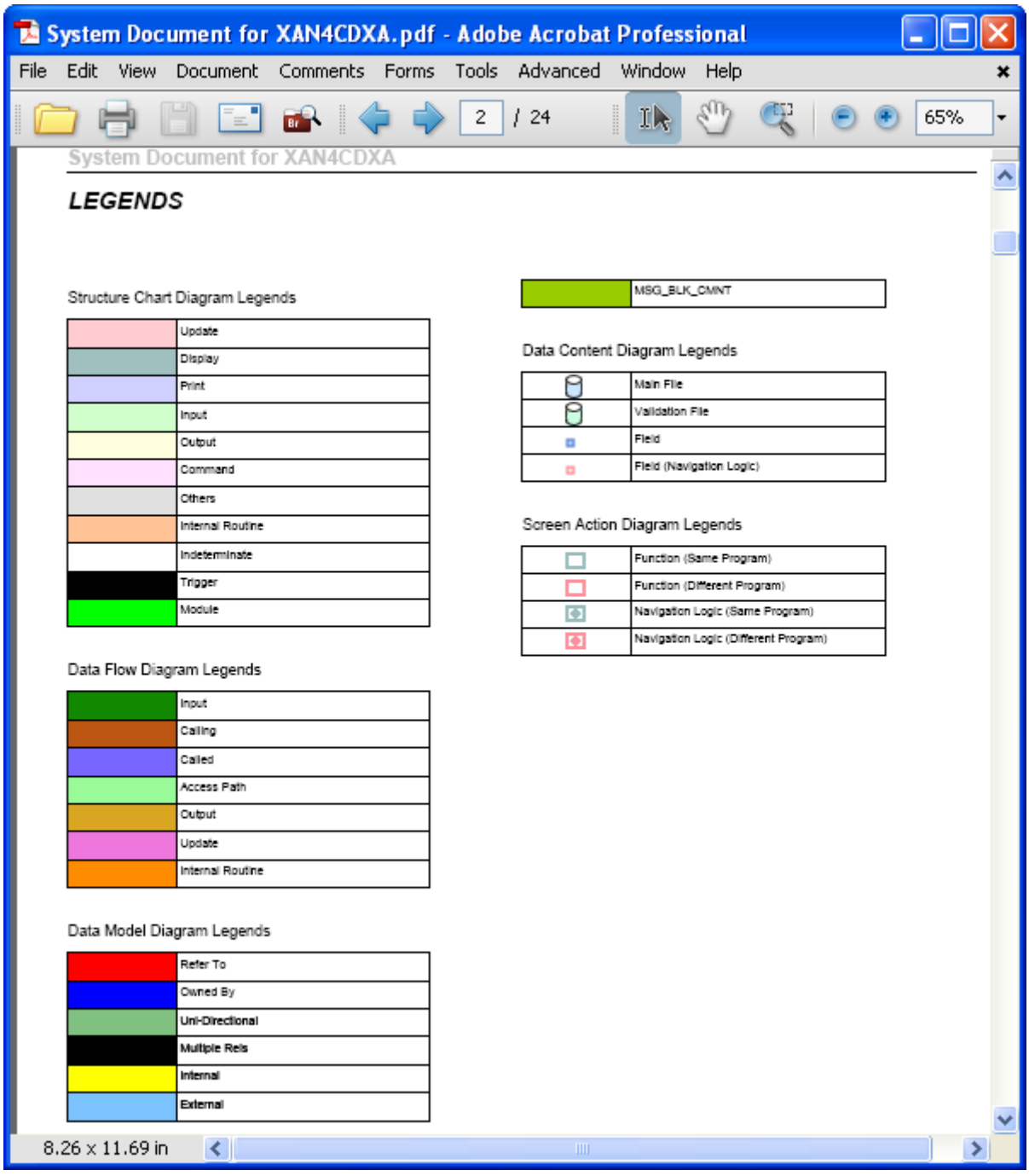
System document - Legends



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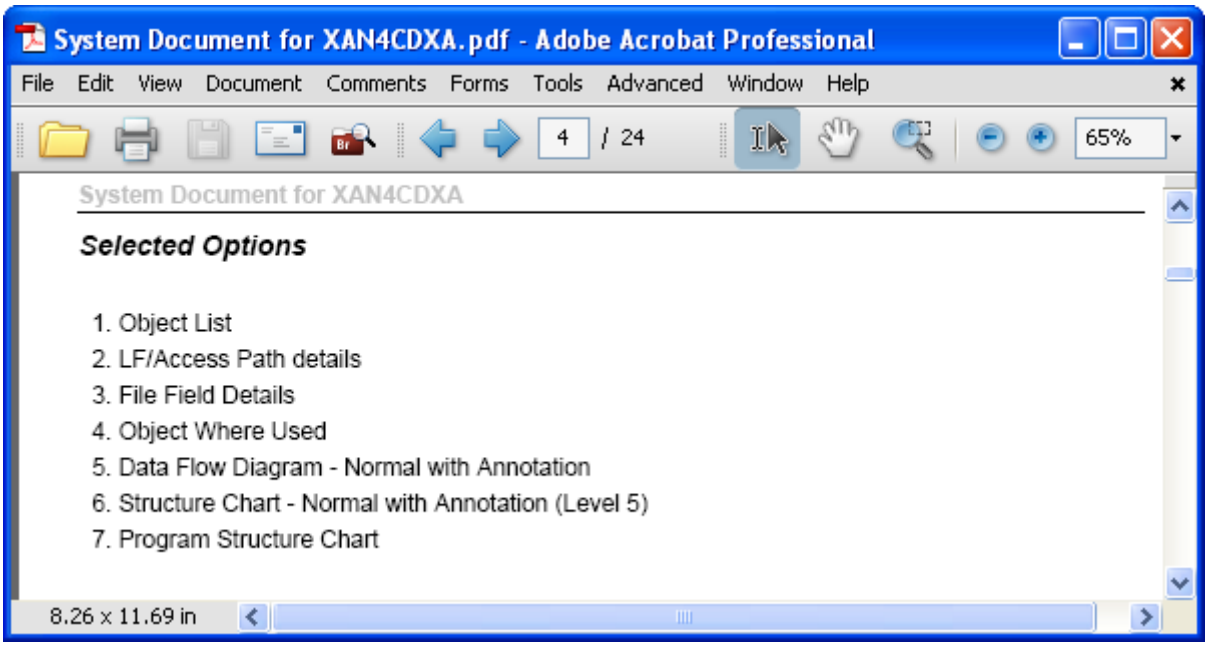
System document – Selected Options


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
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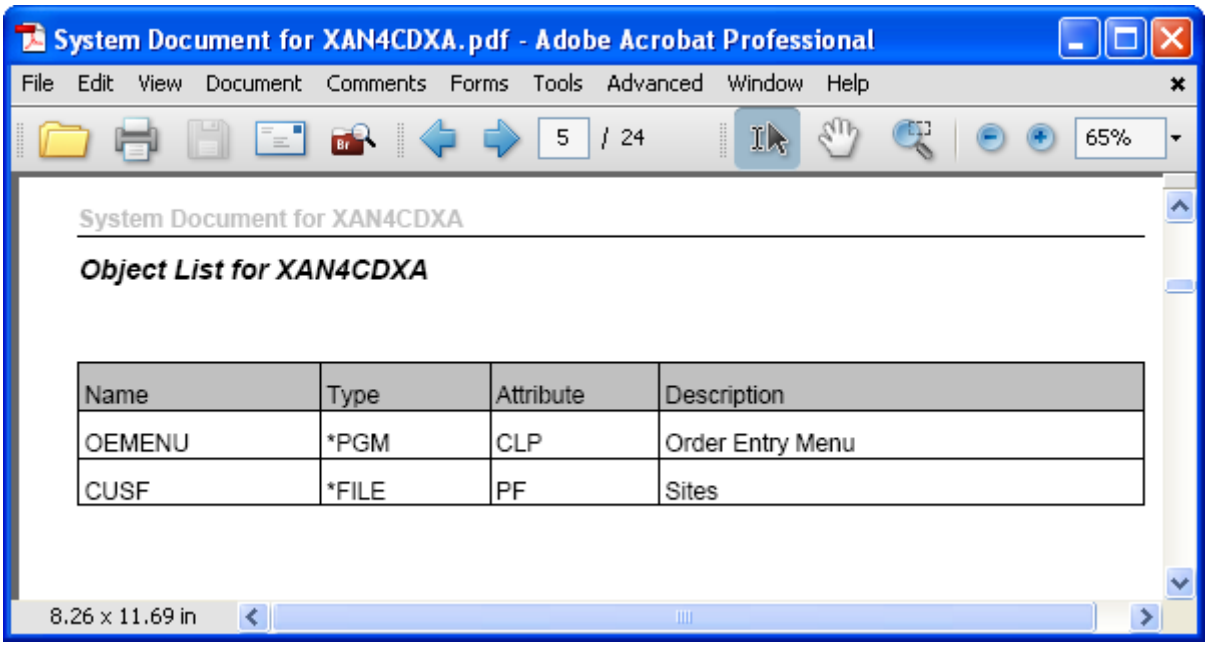
System Document for XAN4CDXA
Selected Options
1. Object List
2. LF/Access Path details
3. File Field Details
4. Object Where Used
5. Data Flow Diagram - Normal with Annotation
6. Structure Chart - Normal with Annotation (Level 5)
7. Program Structure Chart
8.26 x 11.69 in

System document – Object List


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
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65%
System Document for XAN4CDXA
Object List for XAN4CDXA
Name Type Attribute Description
OEMENU *PGM CLP Order Entry Menu
CUSF *FILE PF Sites
8.26 x 11.69 in

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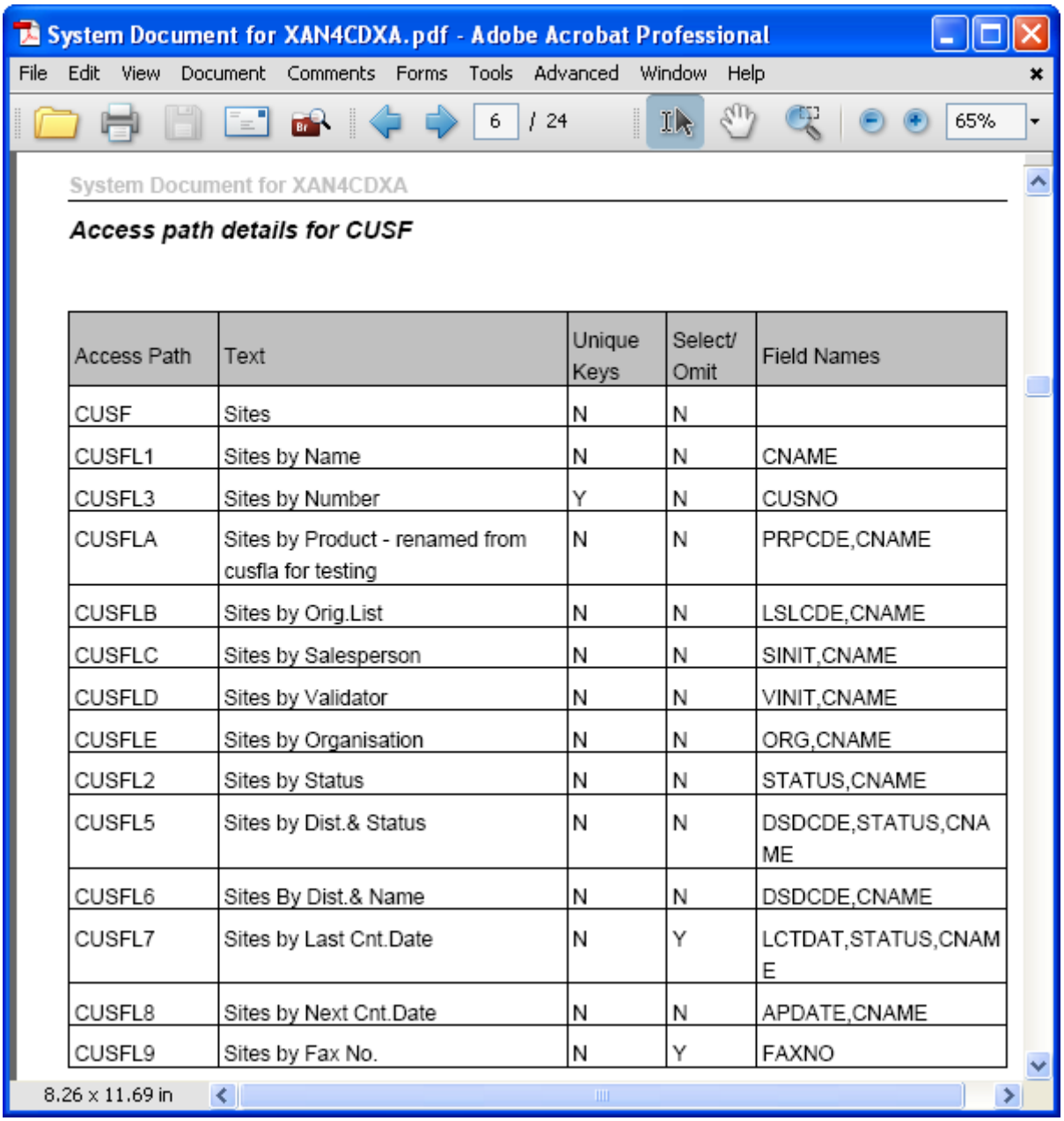
System document – Access Paths


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
6 / 24
65%
System Document for XAN4CDXA
Access path details for CUSF
8.26 x 11.69 in

Access Path	Text	Unique Keys	Select/ Omit	Field Names
CUSF	Sites	N	N	
CUSFL1	Sites by Name	N	N	CNAME
CUSFL3	Sites by Number	Y	N	CUSNO
CUSFLA	Sites by Product - renamed from cusfla for testing	N	N	PRPCDE,CNAME
CUSFLB	Sites by Orig.List	N	N	LSLCDE,CNAME
CUSFLC	Sites by Salesperson	N	N	SINIT,CNAME
CUSFLD	Sites by Validator	N	N	VINIT,CNAME
CUSFLE	Sites by Organisation	N	N	ORG,CNAME
CUSFL2	Sites by Status	N	N	STATUS,CNAME
CUSFL5	Sites by Dist.& Status	N	N	DSDCDE,STATUS,CNAME
CUSFL6	Sites By Dist.& Name	N	N	DSDCDE,CNAME
CUSFL7	Sites by Last Cnt.Date	N	Y	LCTDAT,STATUS,CNAME
CUSFL8	Sites by Next Cnt.Date	N	N	APDATE,CNAME
CUSFL9	Sites by Fax No.	N	Y	FAXNO

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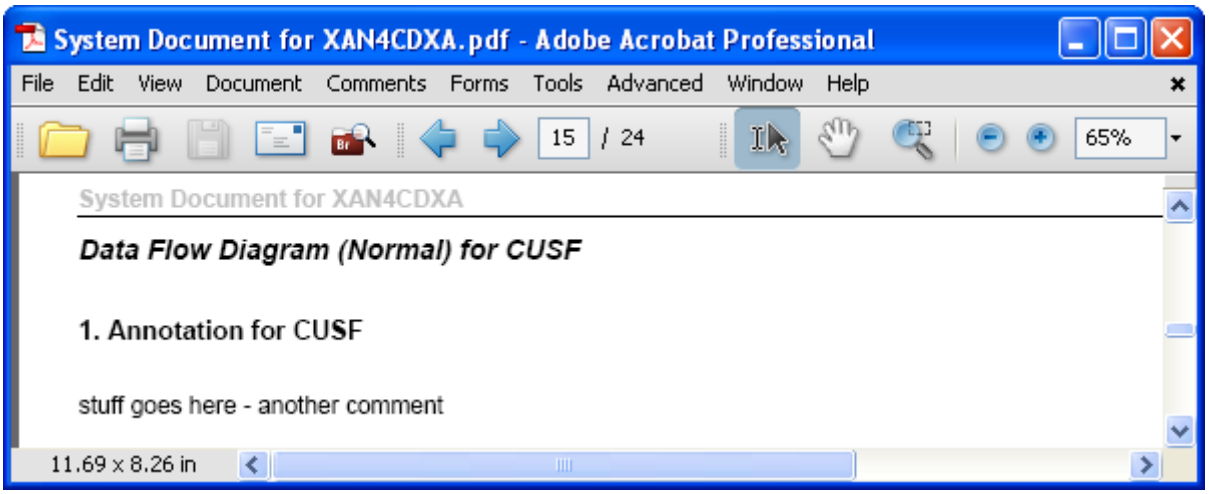
System Document – DFD Annotation


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
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65%
System Document for XAN4CDXA
Data Flow Diagram (Normal) for CUSF
1. Annotation for CUSF
stuff goes here - another comment
11.69 x 8.26 in

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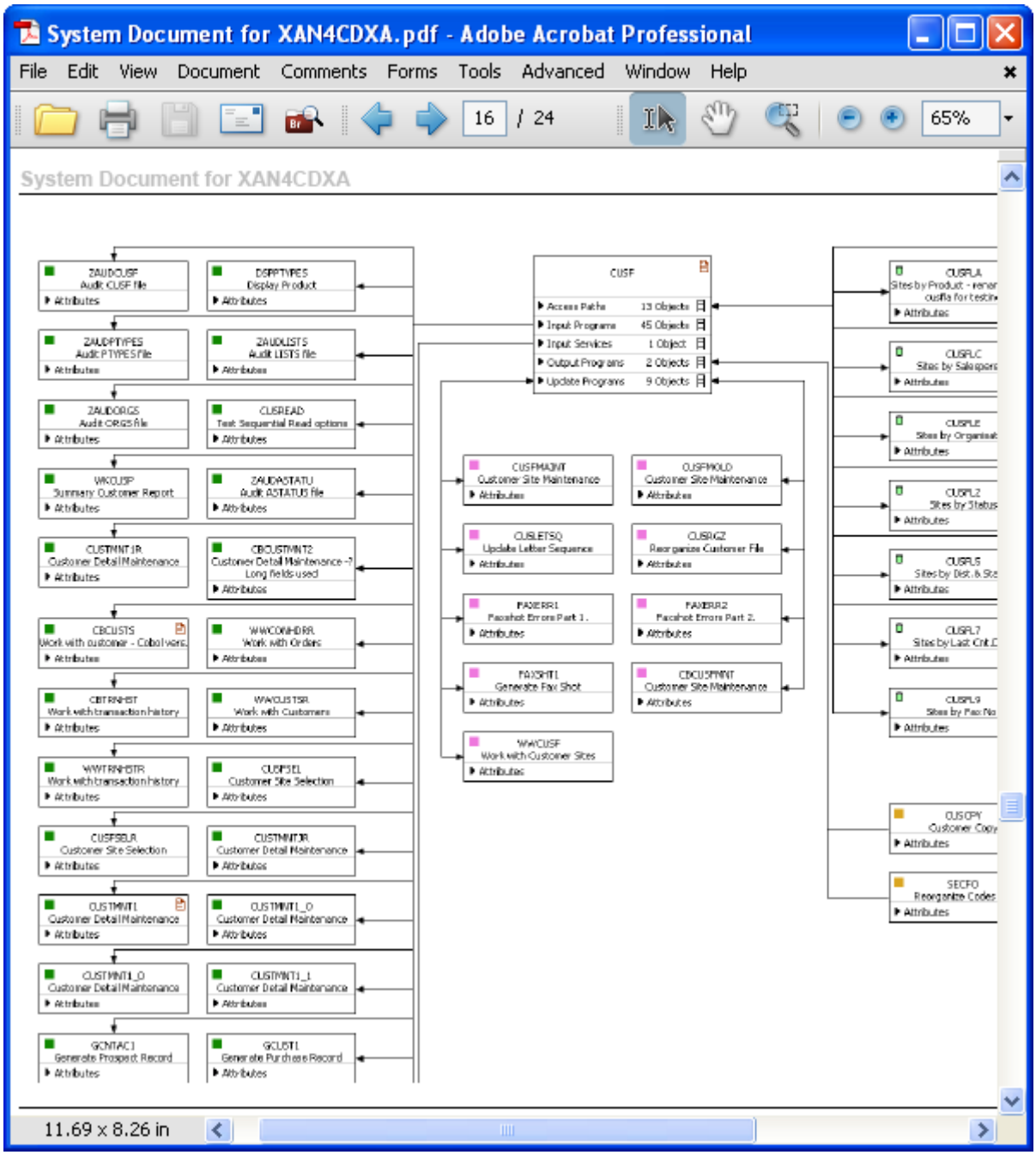
System Document - DFD



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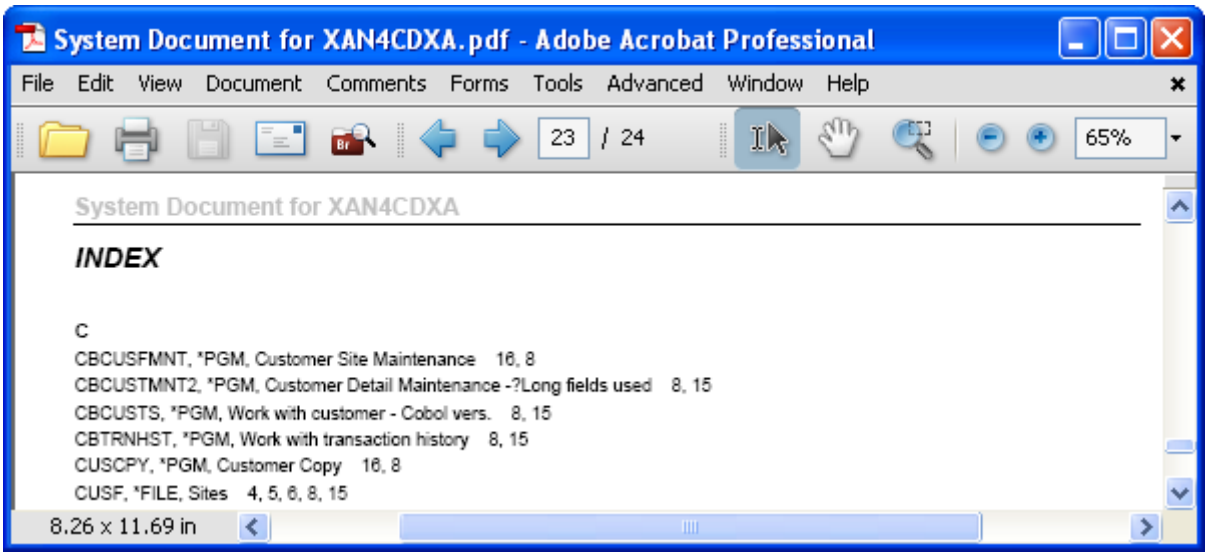
System document - Index


System Document for XAN4CDXA.pdf - Adobe Acrobat Professional
File Edit View Document Comments Forms Tools Advanced Window Help
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System Document for XAN4CDXA
INDEX
C
CBCUSFMNT, *PGM, Customer Site Maintenance 16, 8
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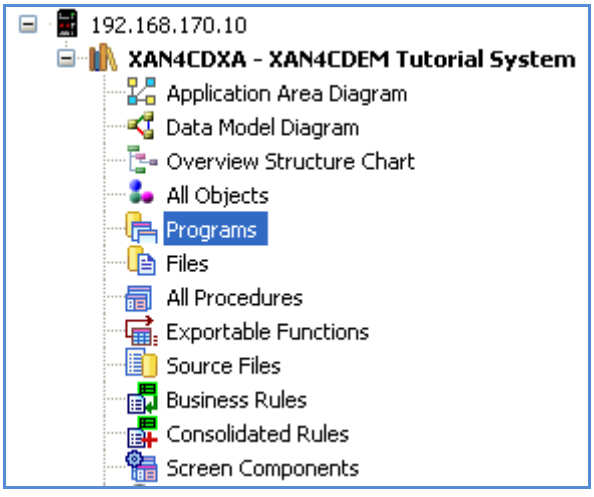
CBCUSTS, *PGM, Work with customer - Cobol vers. 8, 15
CBTRNHST, *PGM, Work with transaction history 8, 15
CUSCPY, *PGM, Customer Copy 16, 8
CUSF, *FILE, Sites 4, 5, 6, 8, 15
8.26 x 11.69 in

Source Browser

The process of system analysis, reviewing, re-factoring, maintaining, or redeveloping is incomplete without looking into the application's source code. X-Analysis supports some very advanced features in its Source Browser.

Get an object list for all programs available in the application library. Double click **Programs** node under the application library in the navigation tree.

Work with Programs



This action invokes the - Work with Objects - dialog for object type '*PGM'.

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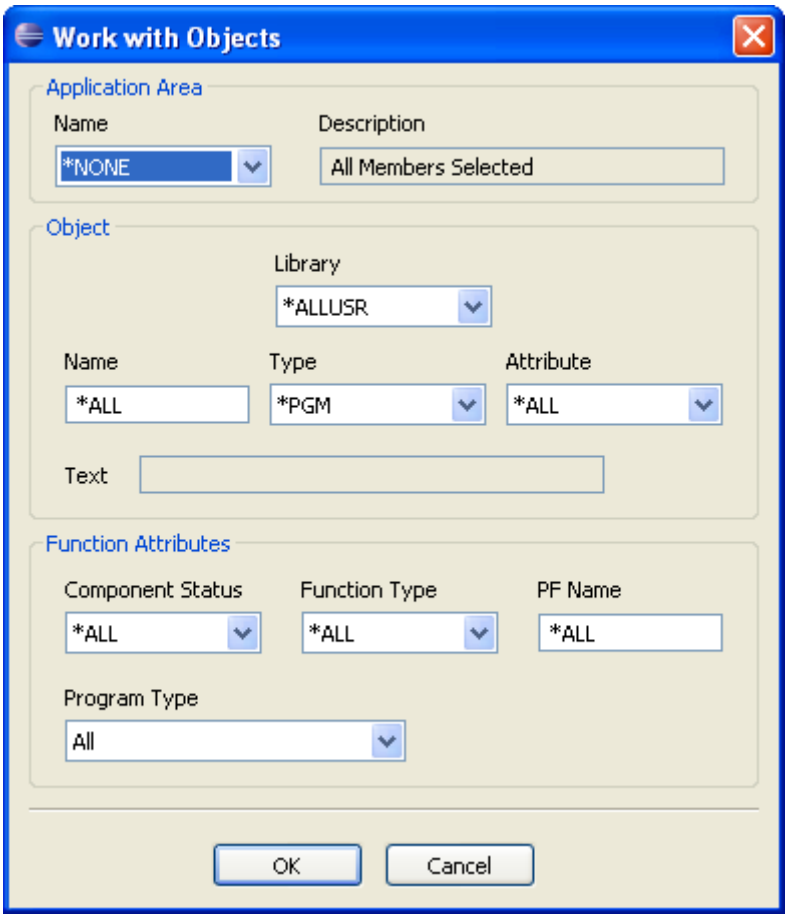
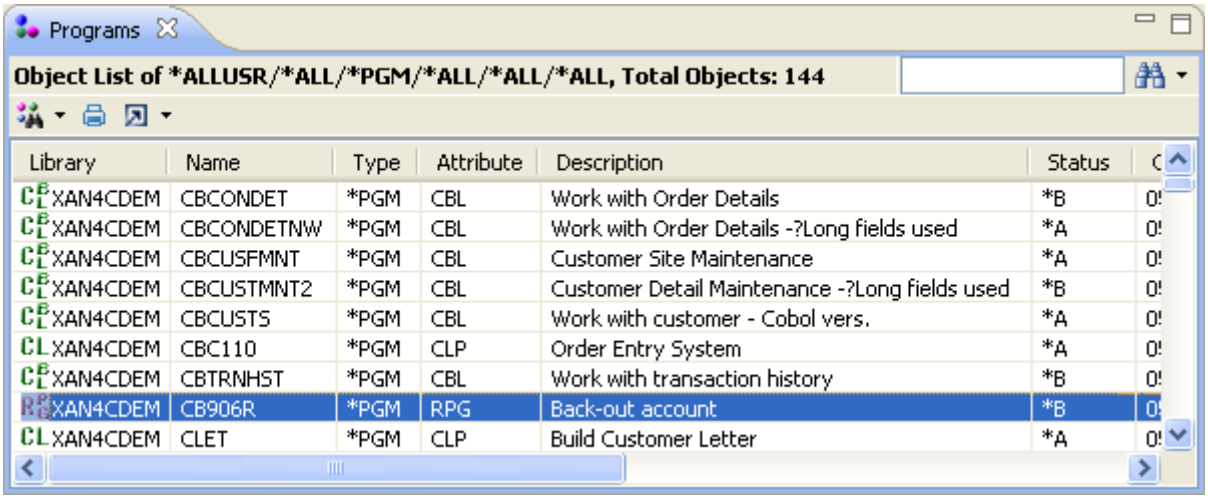
Object List dialog



Click the **OK** button to generate the list of program objects.

Object List for all Programs


Programs
Object List of *ALLUSR/*ALL/*PGM/*ALL/*ALL/*ALL, Total Objects: 144
Library
Name
Type
Attribute
Description
Status
XAN4CDEM CBCONDET *PGM CBL Work with Order Details *B
XAN4CDEM CBCONDETNW *PGM CBL Work with Order Details -?Long fields used *A
XAN4CDEM CBCUSFMNT *PGM CBL Customer Site Maintenance *A
XAN4CDEM CBCUSTMNT2 *PGM CBL Customer Detail Maintenance -?Long fields used *B
XAN4CDEM CBCUSTS *PGM CBL Work with customer - Cobol vers. *A
XAN4CDEM CBC110 *PGM CLP Order Entry System *A
XAN4CDEM CBTRNHST *PGM CBL Work with transaction history *B
XAN4CDEM CB906R *PGM RPG Back-out account *B
XAN4CDEM CLET *PGM CLP Build Customer Letter *A

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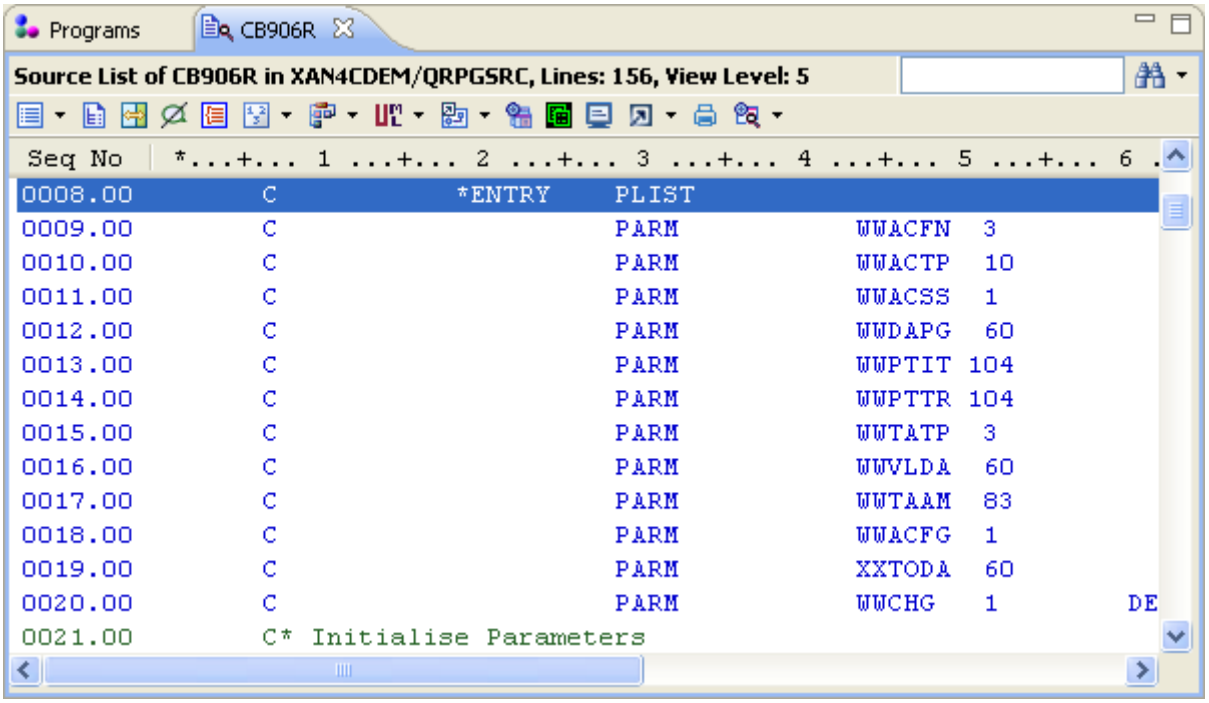
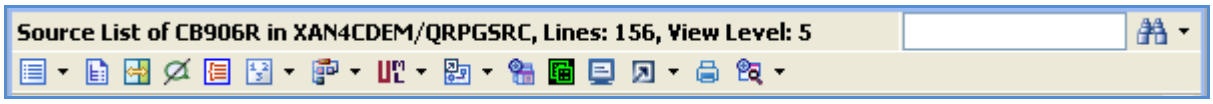
Double click the program **CB906R** from the object list. This calls the Source Browser for the member CB906R.

Source Browser displaying CB906R source


Programs
CB906R
Source List of CB906R in XAN4CDEM/QRPGSRC, Lines: 156, View Level: 5
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0008.00 C *ENTRY PLIST
0009.00 C PARM WWACFN 3
0010.00 C PARM WWACTP 10
0011.00 C PARM WWACSS 1
0012.00 C PARM WWDAPG 60
0013.00 C PARM WWPTIT 104
0014.00 C PARM WWPTTR 104
0015.00 C PARM WWTATP 3
0016.00 C PARM WWVLDA 60
0017.00 C PARM WWTAAM 83
0018.00 C PARM WWACFG 1
0019.00 C PARM XXTODA 60
0020.00 C PARM WWCHG 1 DE
0021.00 C* Initialise Parameters

Source Browser Toolbar

The Source Browser toolbar has the following options:



- Source Options
- Source Outline
- Display Rules
- Pseudo Code
- Source level
- Diagram Options
- Generate UML
- Flow chart
- Screen Components
- Screen / Report Design
- Zoom in Lpex (available on WDSc/Rdi only) / SEU option (set XA preferences to select the appropriate option).
- Export Options
- Print
- View Code

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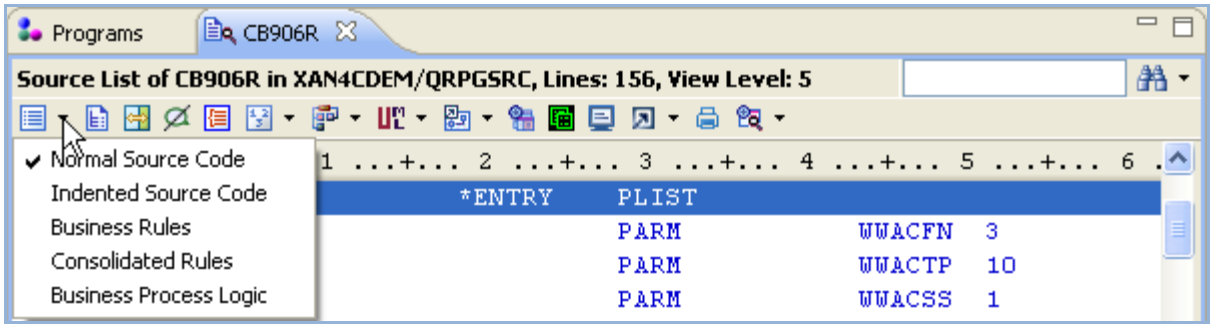
Source Options

The Source Options menu allows a user to view source in various modes. The default source view is - Normal Source Code.

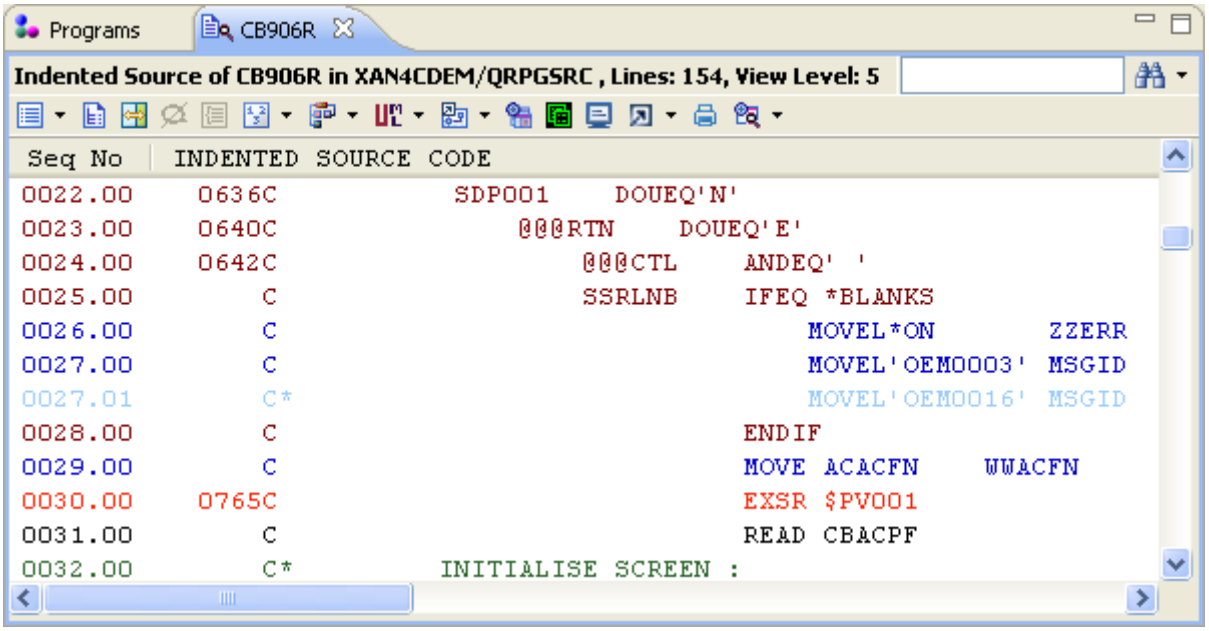
Source Options



Indented Source View

Select **Indented Source Code** option from the Source Options menu. This displays the Indented Source Code view.

Indented Source Code


Programs
CB906R
Indented Source of CB906R in XAN4CDEM/QRPGSRC , Lines: 154, View Level: 5
Seq No INDENTED SOURCE CODE
0022.00 0636C SDP001 DOUEQ'N'
0023.00 0640C @@@RTN DOUEQ'E'
0024.00 0642C @@@CTL ANDEQ' '
0025.00 C SSRLNB IFEQ *BLANKS
0026.00 C MOVEL*ON ZZERR
0027.00 C MOVEL'OEM0003' MSGID
0027.01 C* MOVEL'OEM0016' MSGID
0028.00 C ENDIF
0029.00 C MOVE ACACFN WWACFN
0030.00 0765C EXSR $PV001
0031.00 C READ CBACPF
0032.00 C* INITIALISE SCREEN :

Return to Normal Source Code by selecting the **Normal Source Code** option.

Source Outline

The Source Outline feature displays an outline of the source member. The Source Outline view lists all subroutines available in the code.

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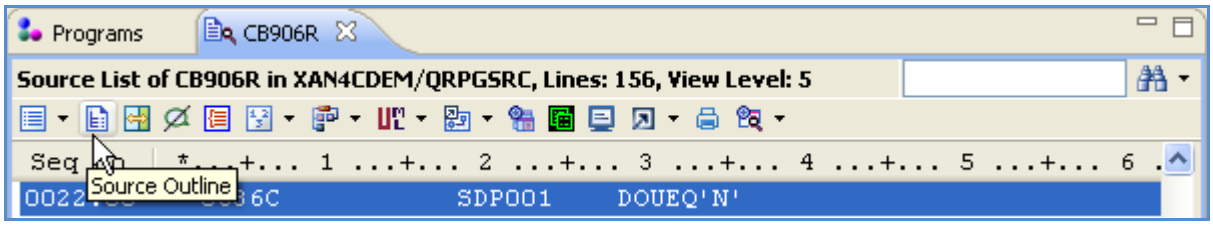
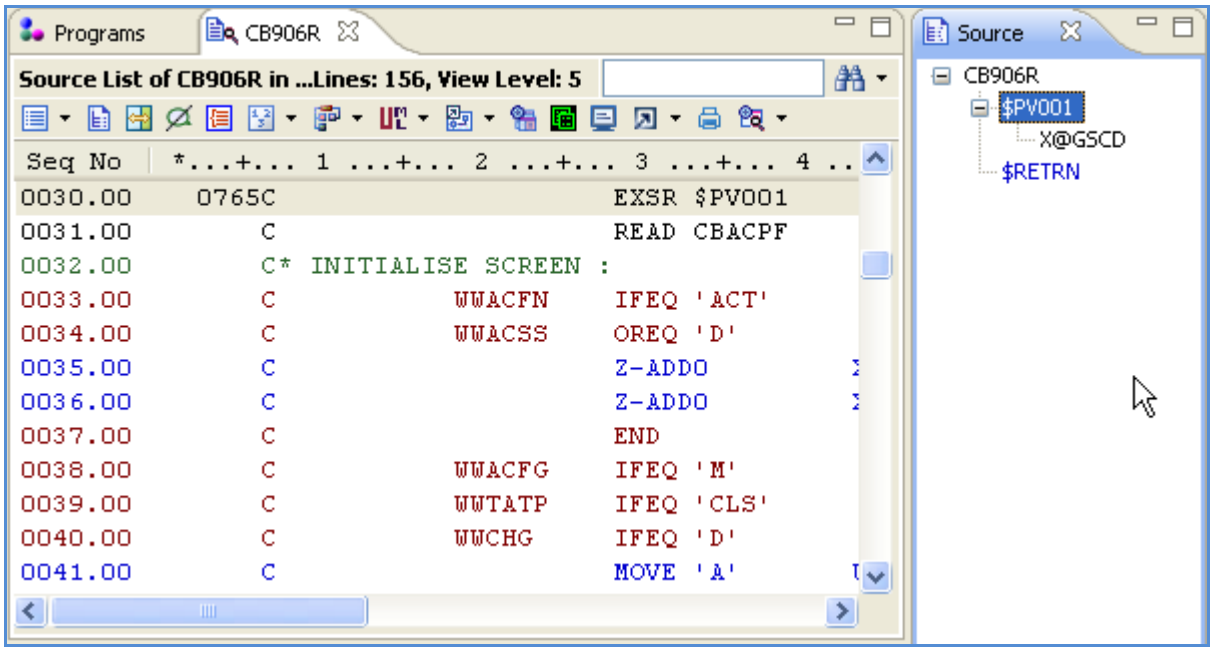
Source Outline option



Double click on any of the listed subroutines. This positions the cursor on the subroutine inside the source browser.

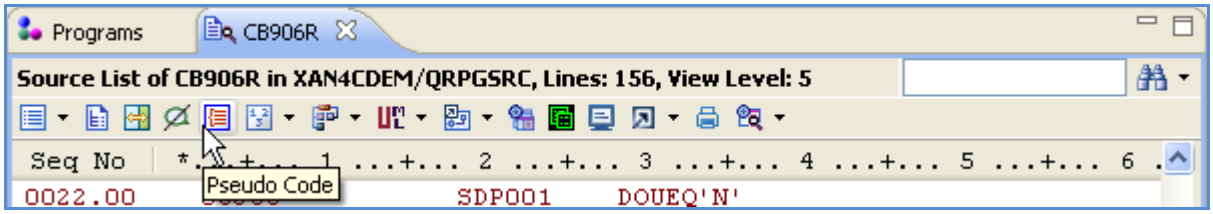
Source Outline of CB906R



Pseudo Code

The Pseudo Code or Structured English view helps a non-technical user to understand the code better. Click the **Pseudo Code** icon.

Pseudo Code option



This brings up the Pseudo Code view.

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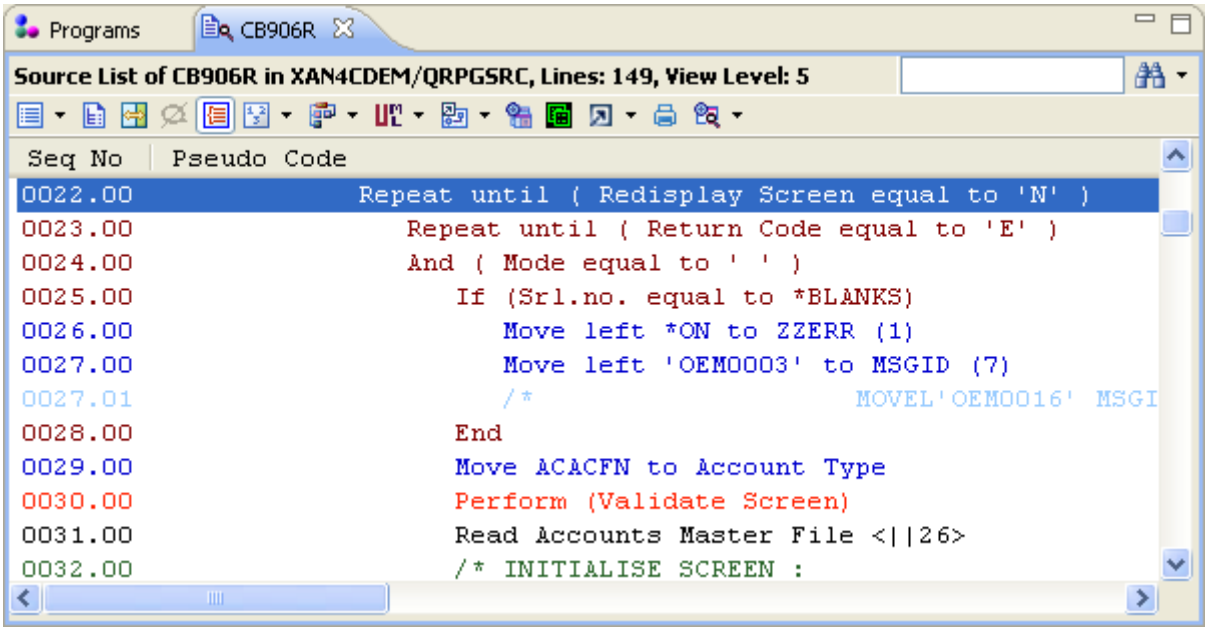
Pseudo Code

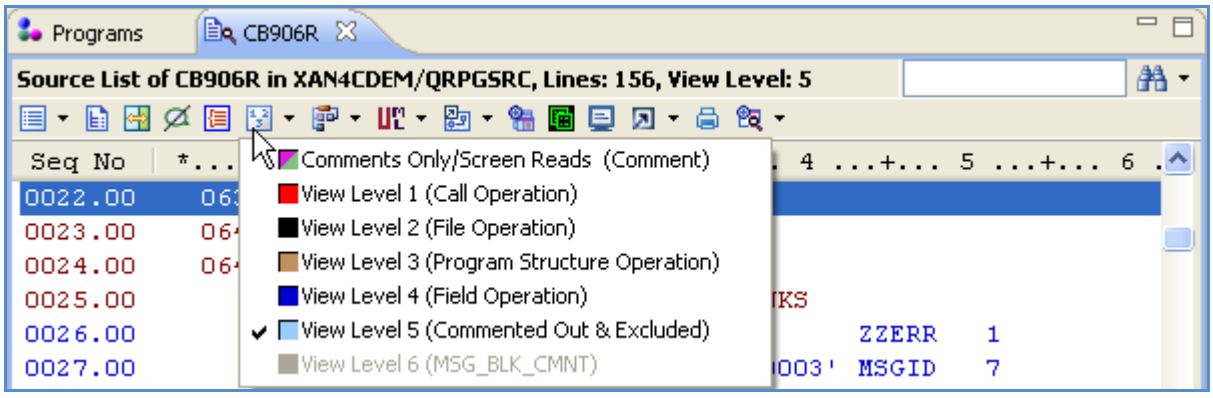

Programs
CB906R
Source List of CB906R in XAN4CDEM/QRPGSRC, Lines: 149, View Level: 5
Seq No
Pseudo Code
0022.00 Repeat until (Redisplay Screen equal to 'N')
0023.00 Repeat until (Return Code equal to 'E')
0024.00 And (Mode equal to ' ')
0025.00 If (Srl.no. equal to *BLANKS)
0026.00 Move left *ON to ZZERR (1)
0027.00 Move left 'OEM0003' to MSGID (7)
0027.01 /* MOVEL'OEM0016' MSGI
0028.00 End
0029.00 Move ACACFN to Account Type
0030.00 Perform (Validate Screen)
0031.00 Read Accounts Master File <||26>
0032.00 /* INITIALISE SCREEN :

The Pseudo Code icon has a behaviour toggle. Click it again to return to Normal Source Code.

Source Level

The Source Level icon allows a user to view specific type of source lines by switching to different view levels, for easy understanding of the code. By default, the source level is '5'.

Source Level



Reduce the source level to **View Level 1**. This restricts the source list to display comments and call operations only.

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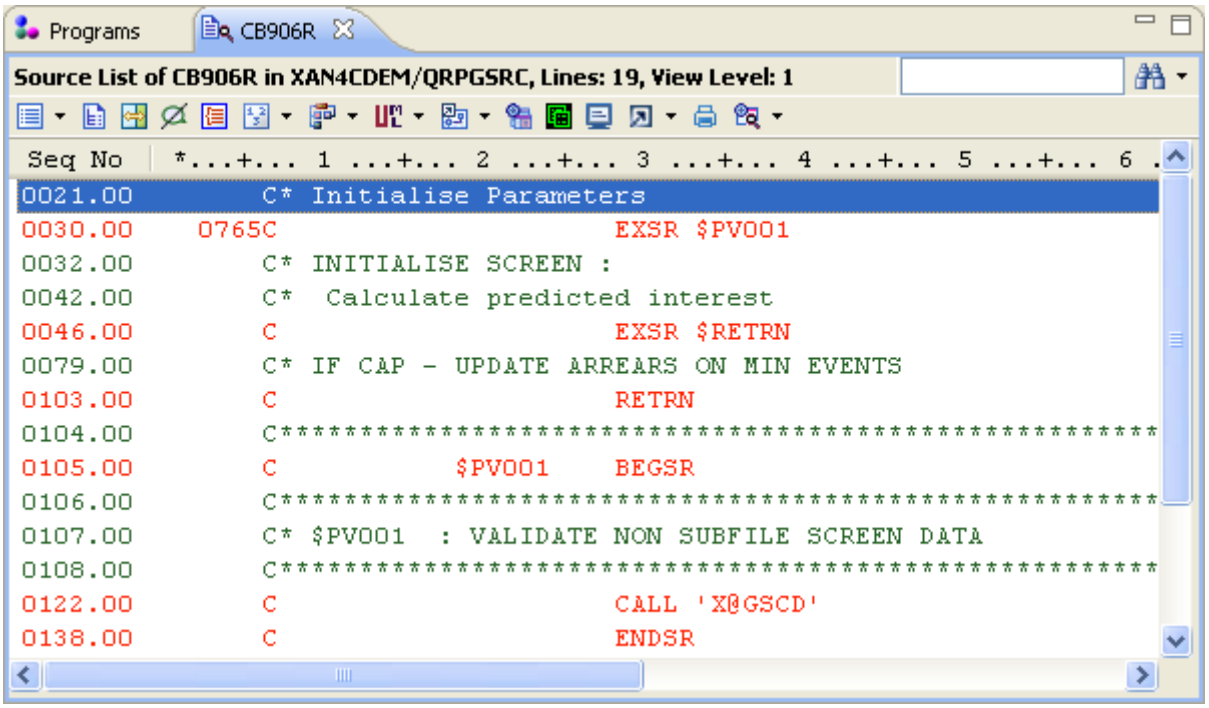
Source Browser displaying Source at View Level 1

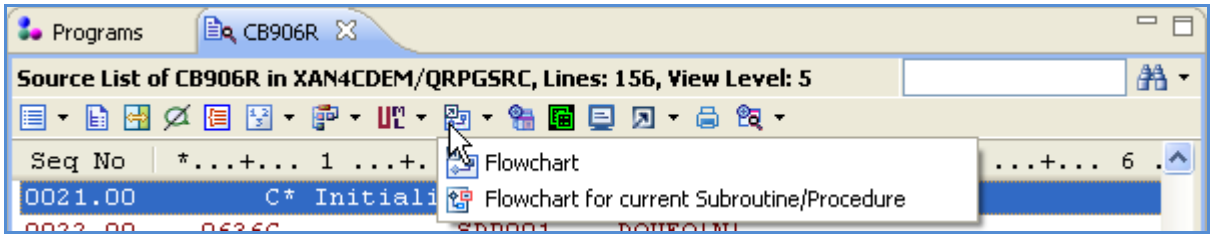

Programs
CB906R
Source List of CB906R in XAN4CDEM/QRPGSRC, Lines: 19, View Level: 1
Seq No
*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0021.00 C* Initialise Parameters
0030.00 0765C EXSR $PV001
0032.00 C* INITIALISE SCREEN :
0042.00 C* Calculate predicted interest
0046.00 C EXSR $RETRN
0079.00 C* IF CAP - UPDATE ARREARS ON MIN EVENTS
0103.00 C RETRN
0104.00 C**********
0105.00 C $PV001 BEGSR
0106.00 C**********
0107.00 C* $PV001 : VALIDATE NON SUBFILE SCREEN DATA
0108.00 C**********
0122.00 C CALL 'X@GSCD'
0138.00 C ENDSR

- View Level 2 includes File Operations.
- View Level 3 includes Program Structure Operations.
- View Level 4 includes Field Operation.
- View Level 5 includes the Commented Out code & Exclude.

Flowchart

The other way to look at program source code is to check the execution model of that program, which is the Data Flowchart. Opt for **Flowchart** option from source browser. This generates Program Flowchart in MS Visio.

Flowchart option



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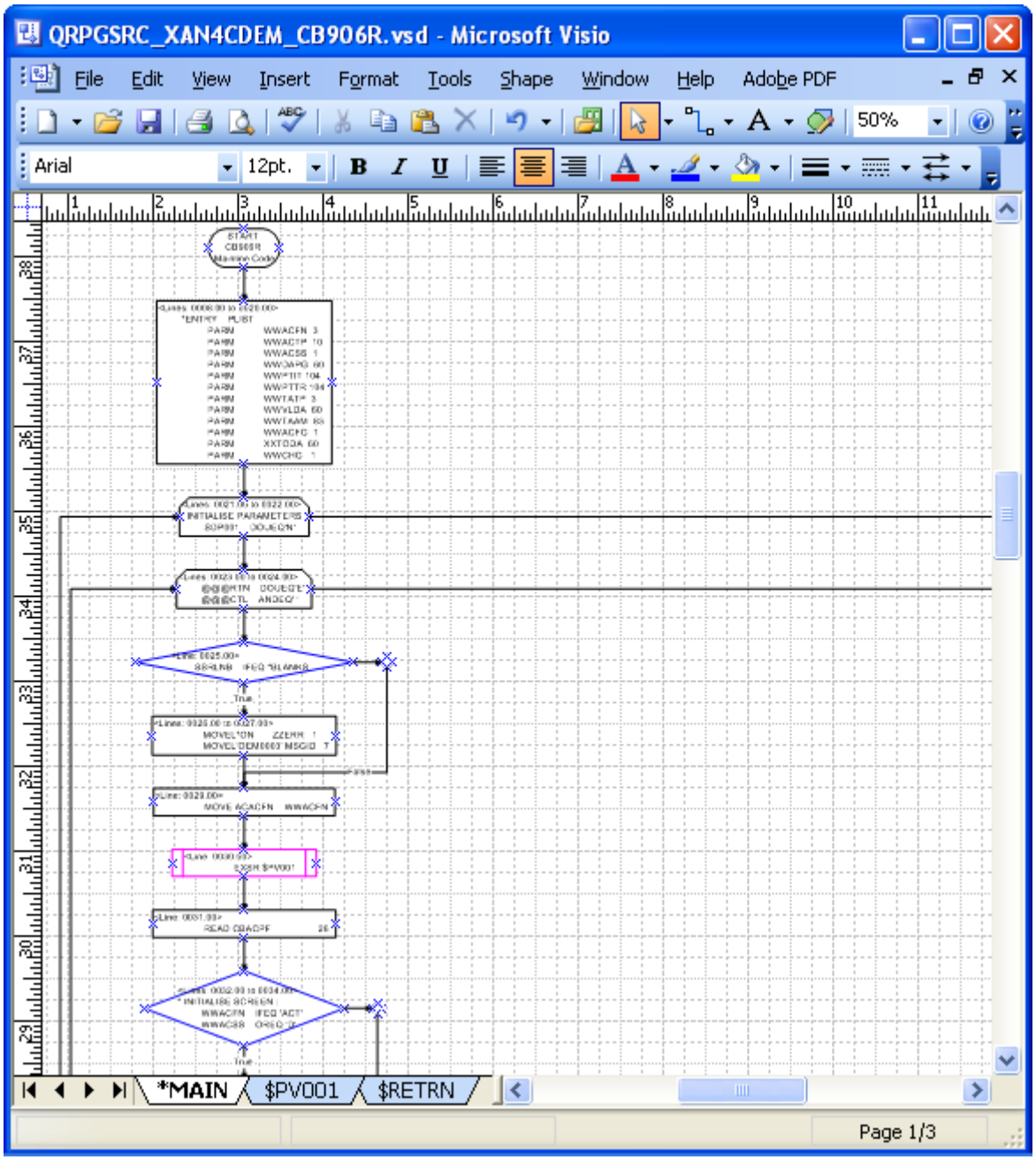
Flowchart in MS Visio



Note that the flowchart option creates an individual flowchart for each subroutine. The first page of the flowchart displays the processing for the Main Procedure. From the Main Procedure a user can jump to any of the subroutines available in the program.

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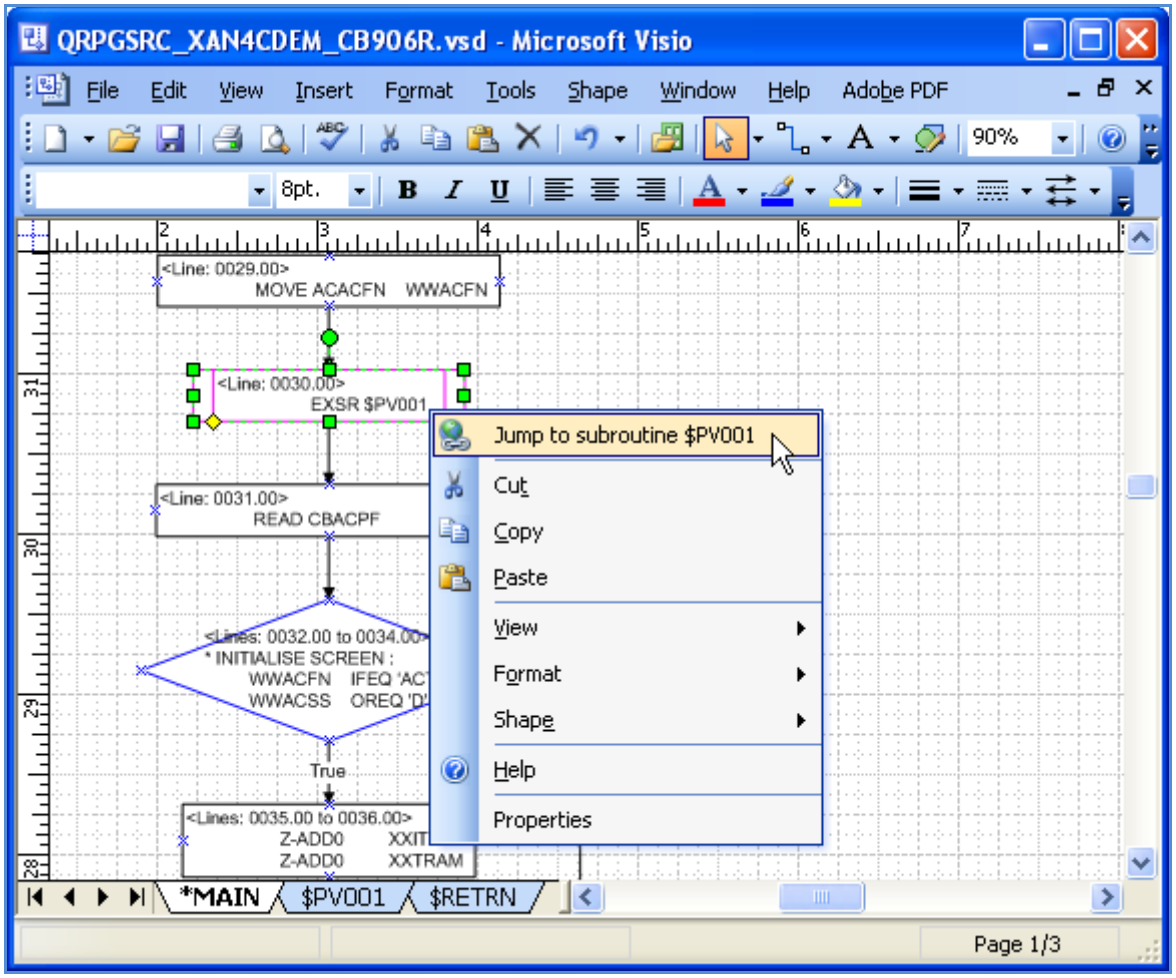
Jump option on the Flowchart



From the context menu, click **Jump to subroutine $PV0001** option to switch to flowchart for the subroutine '$PV0001'.

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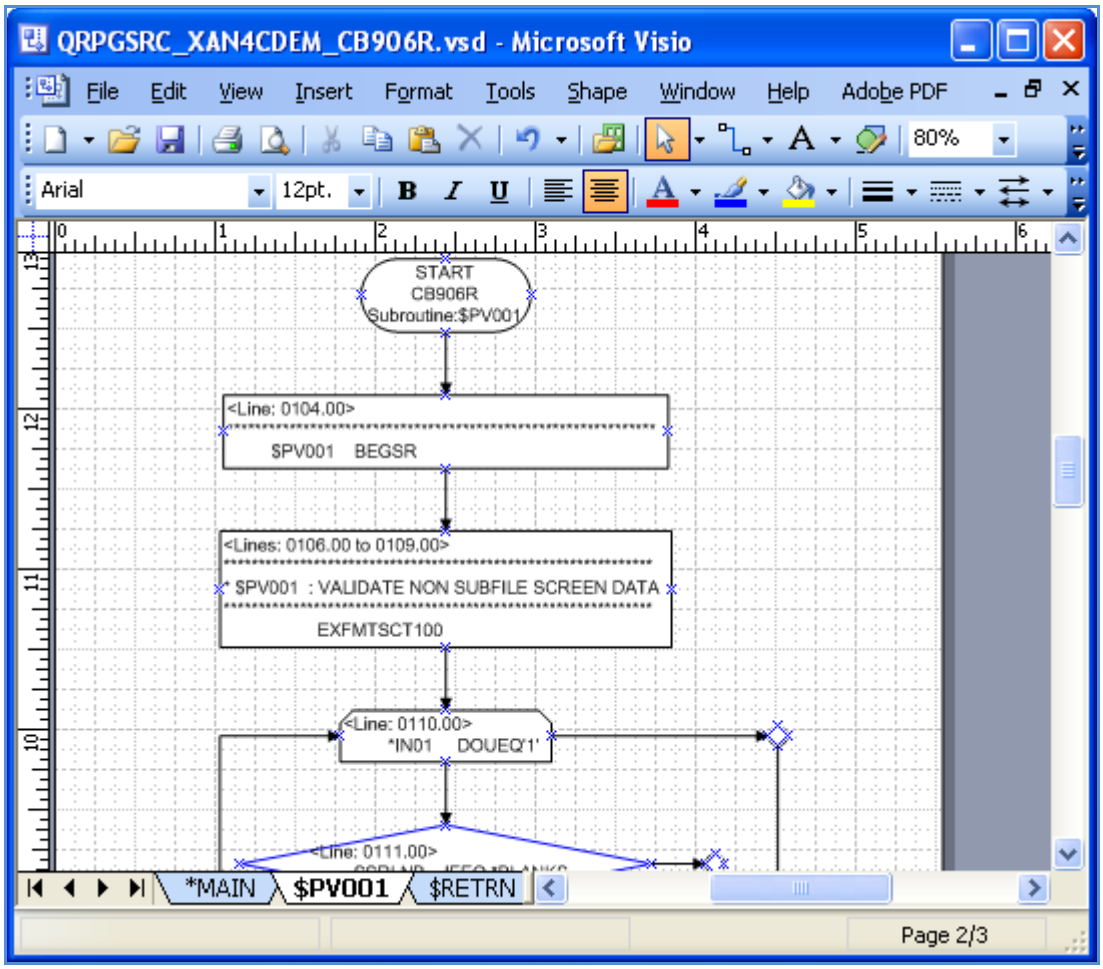
Subroutine Flowchart

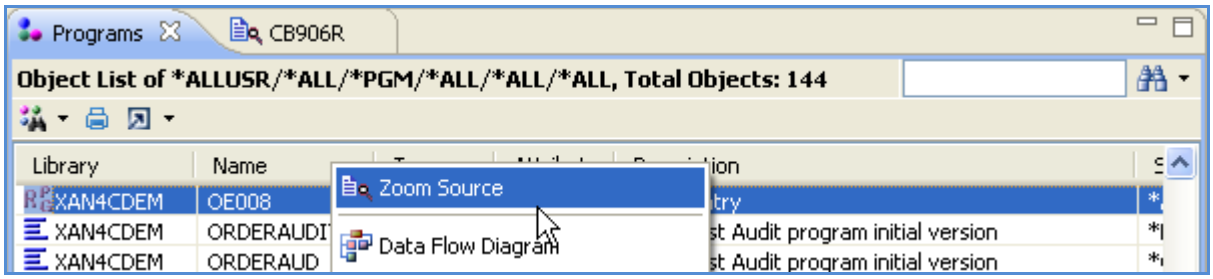


Other Options on the Source Browser

To understand other options available on the source browser, open the source browser for the program OE008. To call the source browser for OE008 go to the object list.

From the object list, locate and select the program OE008. Bring up the context menu for the program OE008 and opt **Zoom Source** option.

Context menu on OE008



This brings up the source browser for the program OE008:

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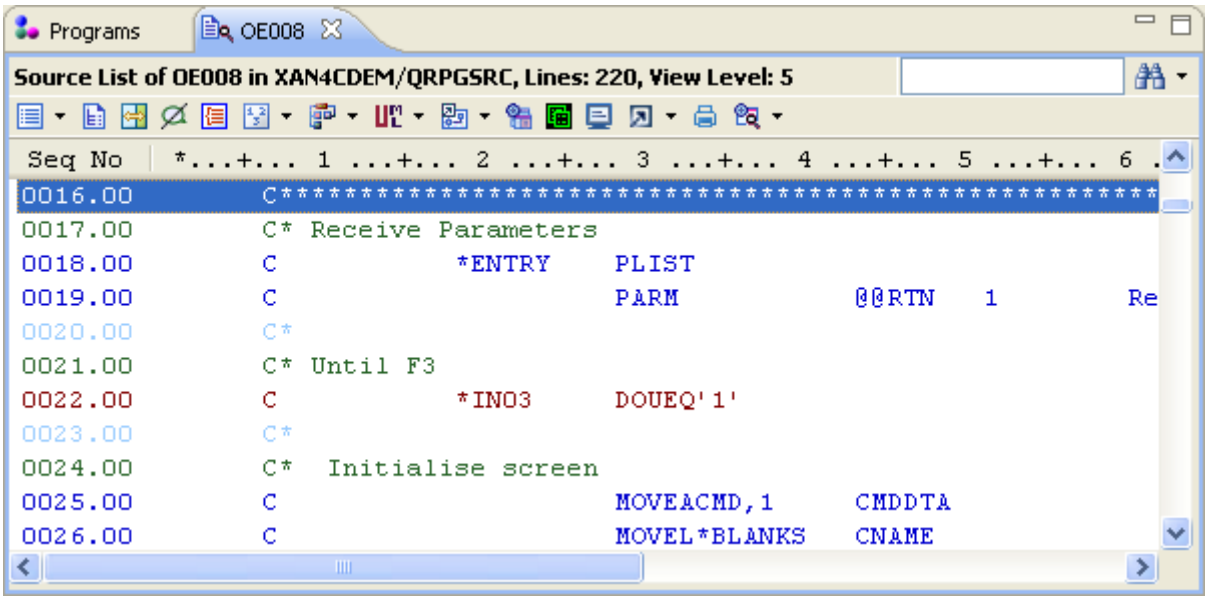
Source Browser for program OE008

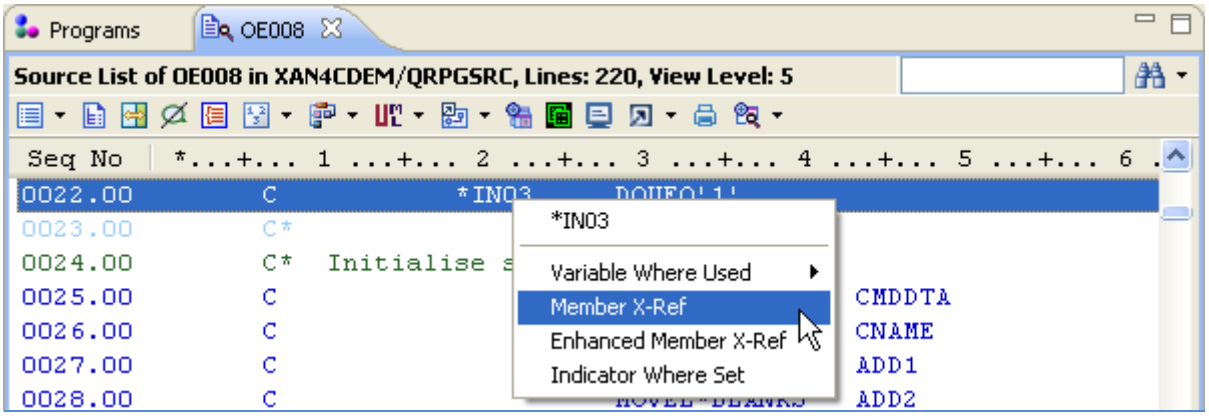

Programs
OE008
Source List of OE008 in XAN4CDEM/QRPGSRC, Lines: 220, View Level: 5
Seq No
*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0016.00 C*
0017.00 C* Receive Parameters
0018.00 C *ENTRY PLIST
0019.00 C PARM @@RTN 1 Re
0020.00 C*
0021.00 C* Until F3
0022.00 C *IN03 DOUEQ'1'
0023.00 C*
0024.00 C* Initialise screen
0025.00 C MOVEACMD,1 CMDDTA
0026.00 C MOVEL*BLANKS CNAME

Let us now discuss other important options available on the source browser.

Member X-Reference

On the source browser for the program OE008, select the line number 0022.00 with indicator '*IN03'. From the context menu on '*IN03', opt **Member X-Ref** option.

Member X-Ref option



This displays the Member X-Ref view for the selected variable ('*IN03'). The Member X-Ref lists all source lines where the selected Field/Variable used/referenced.

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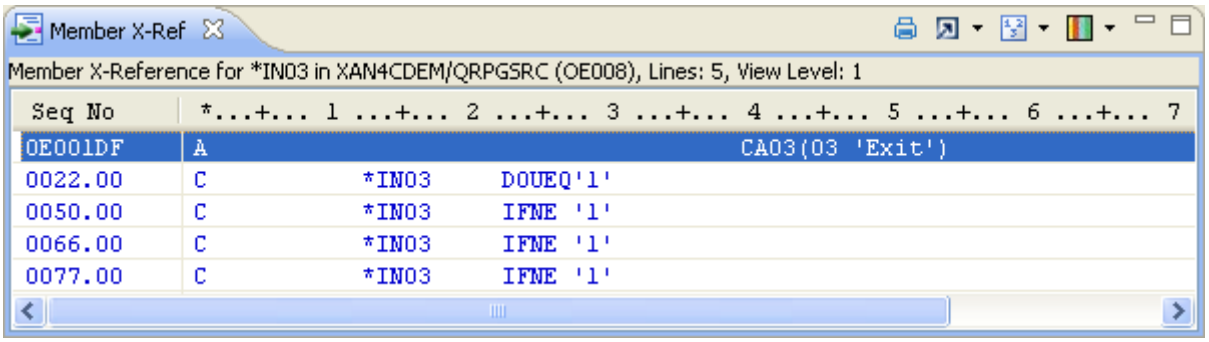
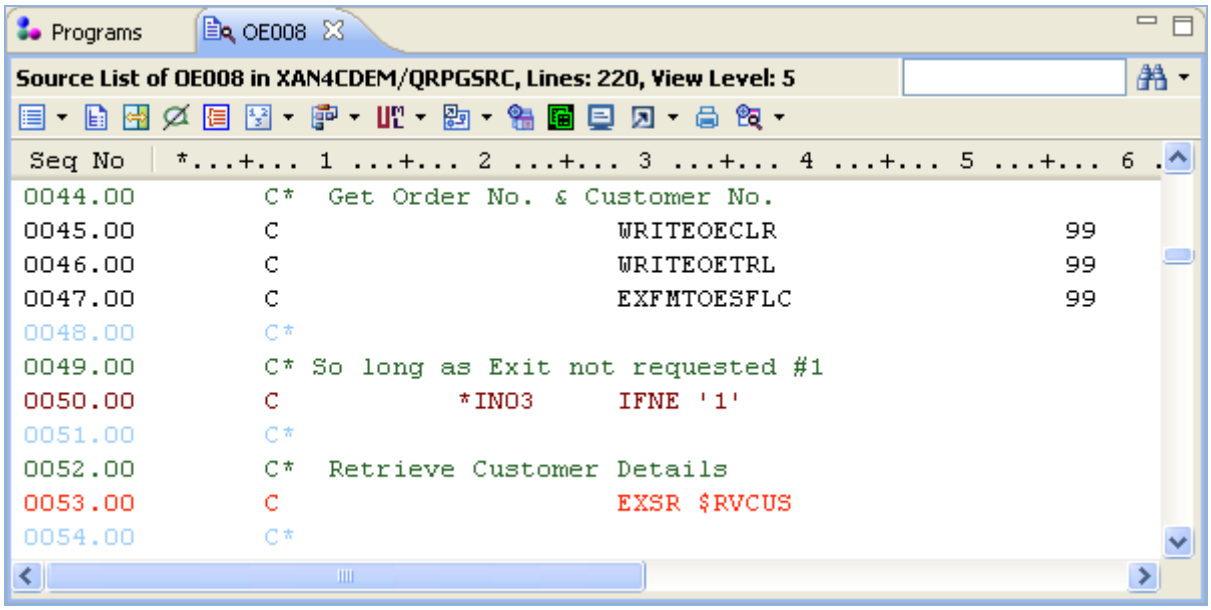
Member X-Ref


Member X-Ref
Member X-Reference for *IN03 in XAN4CDEM/QRPGSRC (OE008), Lines: 5, View Level: 1
Seq No
*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6 ...+... 7
OE001DF A CA03(03 'Exit')
0022.00 C *IN03 DOUEQ'1'
0050.00 C *IN03 IFNE '1'
0066.00 C *IN03 IFNE '1'
0077.00 C *IN03 IFNE '1'

Jump to Subroutine

One of the important features of the source browser is the ability to jump to a subroutine. Double click on one of the subroutines available in the source browser for the program OE008.

Select Subroutine to perform jump action


Programs
OE008
Source List of OE008 in XAN4CDEM/QRPGSRC, Lines: 220, View Level: 5
Seq No
*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0044.00 C* Get Order No. & Customer No.
0045.00 C WRITEOECLR 99
0046.00 C WRITEOETRL 99
0047.00 C EXFMTOESFLC 99
0048.00 C*
0049.00 C* So long as Exit not requested #1
0050.00 C *IN03 IFNE '1'
0051.00 C*
0052.00 C* Retrieve Customer Details
0053.00 C EXSR $RVCUS
0054.00 C*

Double click on **$RVCUS**, which positions the cursor to the beginning of the subroutine - $RVCUS.

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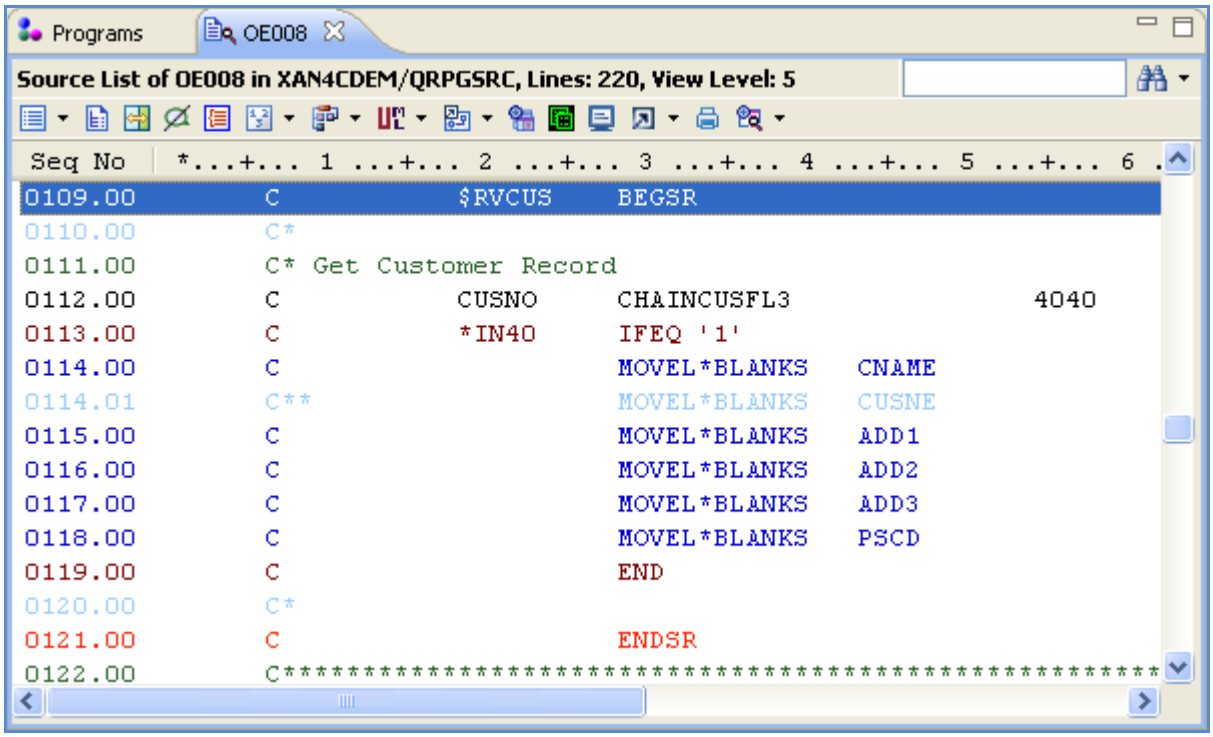
Highlighted first line of the Subroutine


Programs
OE008
Source List of OE008 in XAN4CDEM/QRPGSRC, Lines: 220, View Level: 5
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0109.00 C $RVCUS BEGSR
0110.00 C*
0111.00 C* Get Customer Record
0112.00 C CUSNO CHAINCUSFL3 4040
0113.00 C *IN40 IFEQ '1'
0114.00 C MOVEL*BLANKS CNAME
0114.01 C** MOVEL*BLANKS CUSNE
0115.00 C MOVEL*BLANKS ADD1
0116.00 C MOVEL*BLANKS ADD2
0117.00 C MOVEL*BLANKS ADD3
0118.00 C MOVEL*BLANKS PSCD
0119.00 C END
0120.00 C*
0121.00 C ENDSR
0122.00 C**********

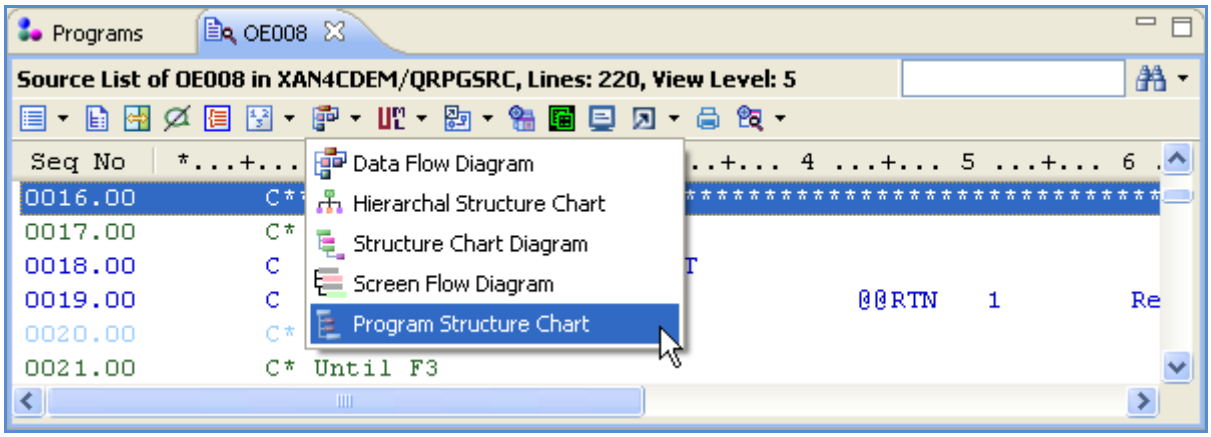
Click the back navigation arrow to go back to the line where the subroutine $RVCUS is called.

Program Structure Chart

Another way of looking at the structure of the program is to view the 'Program Structure Chart' for that program.

A 'Program Structure Chart' graphically displays the sequence of calls in the program. Click the **Program Structure Chart** option available under the 'Diagram Options' dropdown menu on the Source Browser Toolbar.

Program Structure Chart option



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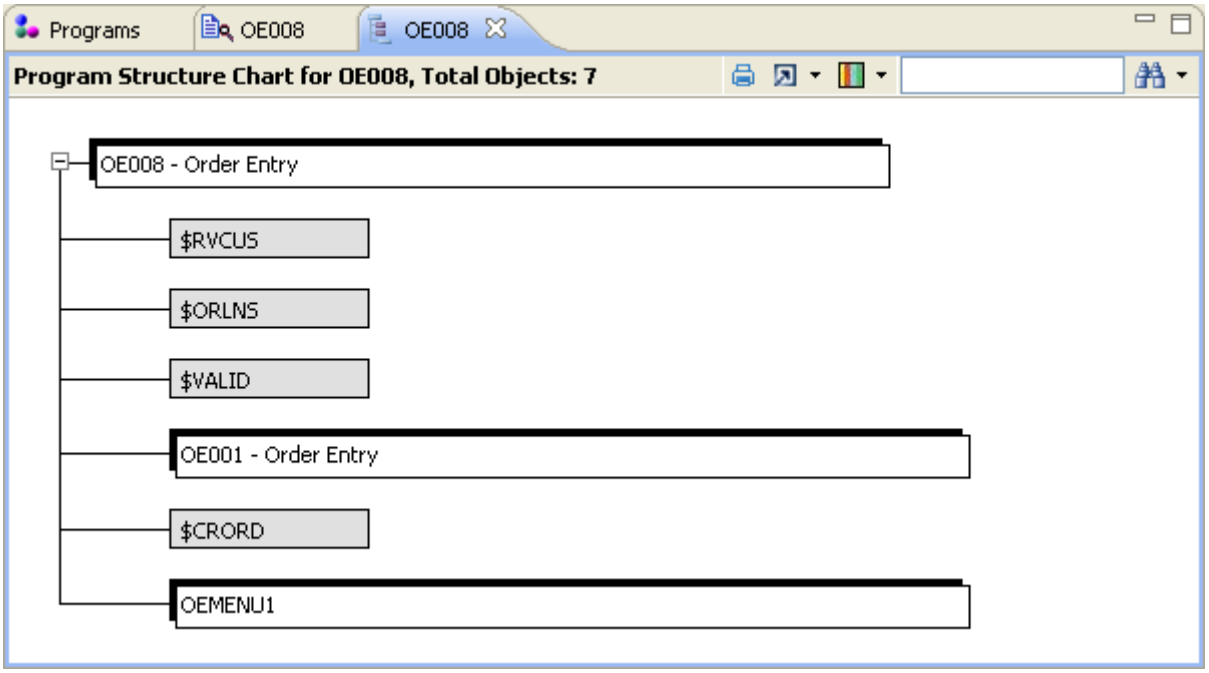
On selecting the 'Program Structure Chart' option, a diagram appears displaying the program structure chart for that program.

Program Structure Chart for the program OE008



The 'Program Structure Chart' shows each subroutine as small rectangles with grey background with the name of each subroutine. The object's type – i.e the Function Type, determines the colouring of all other shapes, Programs, Modules, and Service Programs.

(Boxes other than the subroutines are the same size of a program element as used in the Structure Chart Diagram).

On the Program Structure Chart, double click on a subroutine. This initiates the Source Browser for the program OE008 with the subroutine selected.

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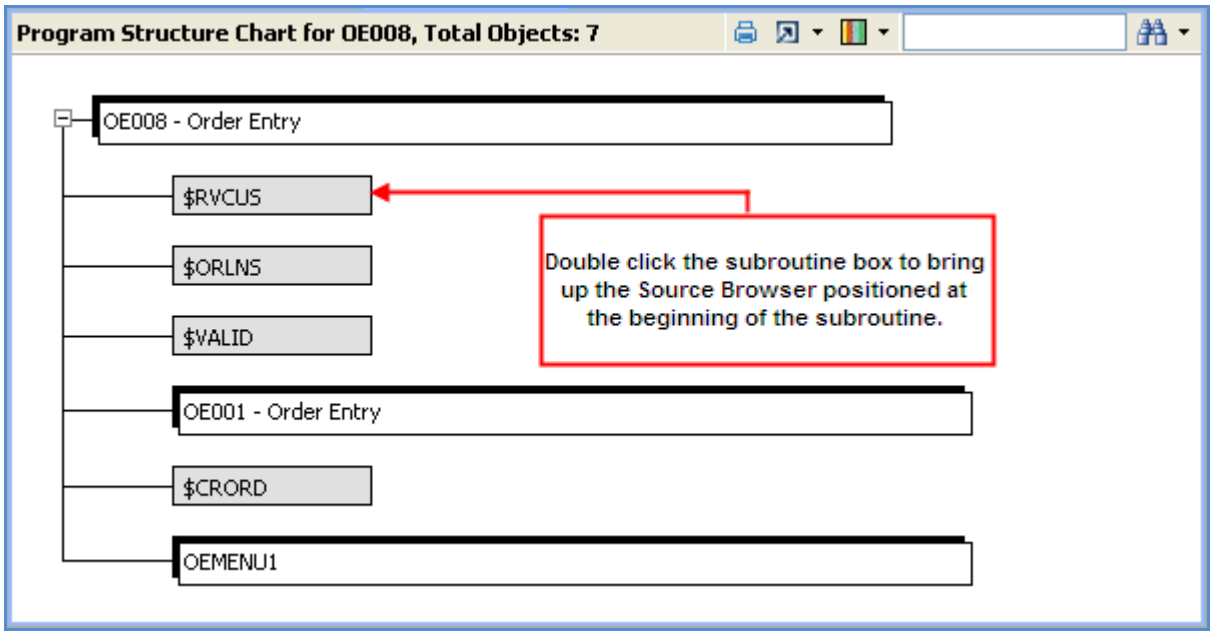
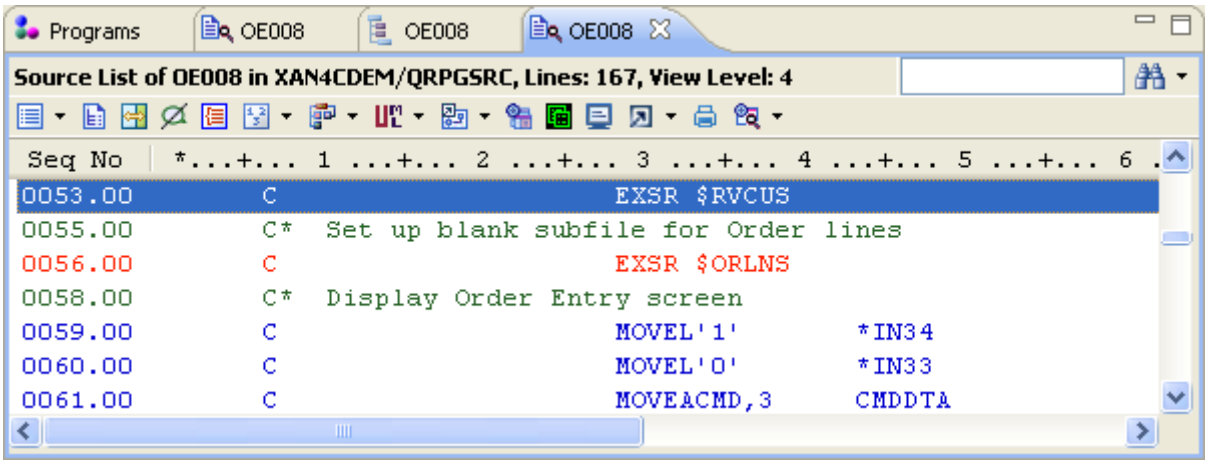
Program Structure Chart with Subroutine selected


Program Structure Chart for OE008, Total Objects: 7
OE008 - Order Entry
$RVCUS
$ORLNS
$VALID
OE001 - Order Entry
$CRORD
OEMENU1
Double click the subroutine box to bring up the Source Browser positioned at the beginning of the subroutine.

This displays the Source Browser for program OE008 with the subroutine '$RVCUS' selected.

Source Browser for program OE008


Programs
OE008
OE008
OE008
Source List of OE008 in XAN4CDEM/QRPGSRC, Lines: 167, View Level: 4
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0053.00 C EXSR $RVCUS
0055.00 C* Set up blank subfile for Order lines
0056.00 C EXSR $ORLNS
0058.00 C* Display Order Entry screen
0059.00 C MOVEL'1' *IN34
0060.00 C MOVEL'0' *IN33
0061.00 C MOVEACMD,3 CMDDTA

Zoom Source to Files defined in File Specification.

The program OE008 has files defined in the File Specification:

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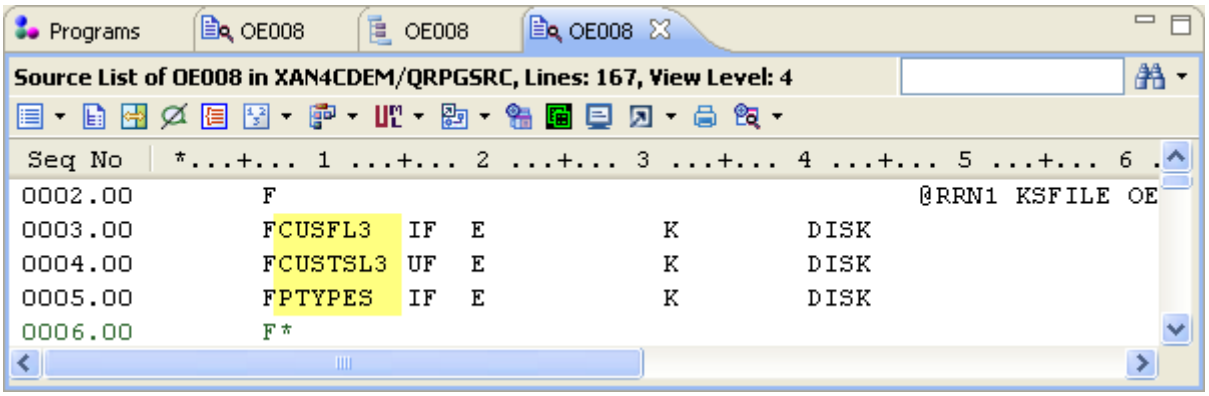
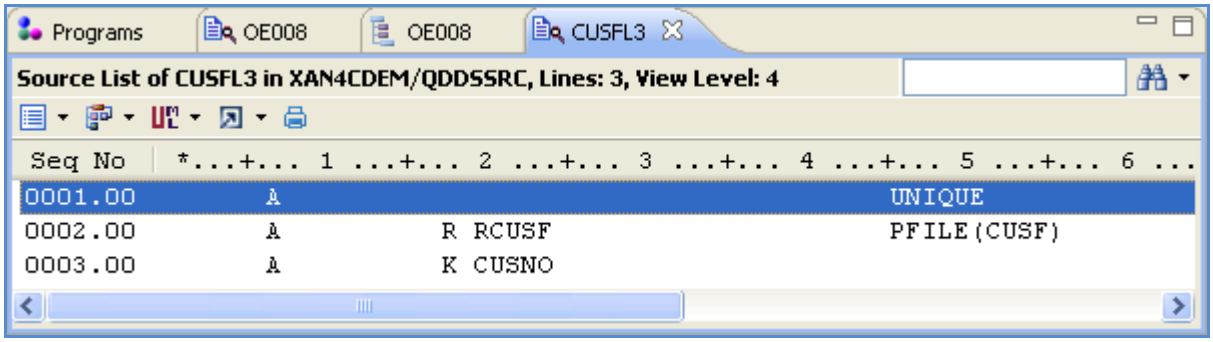
Files listed on OE008 source


Programs
OE008
OE008
OE008
Source List of OE008 in XAN4CDEM/QRPGSRC, Lines: 167, View Level: 4
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0002.00 F @RRN1 KSFILE OE
0003.00 FCUSFL3 IF E K DISK
0004.00 FCUSTSL3 UF E K DISK
0005.00 FPTYPES IF E K DISK
0006.00 F*

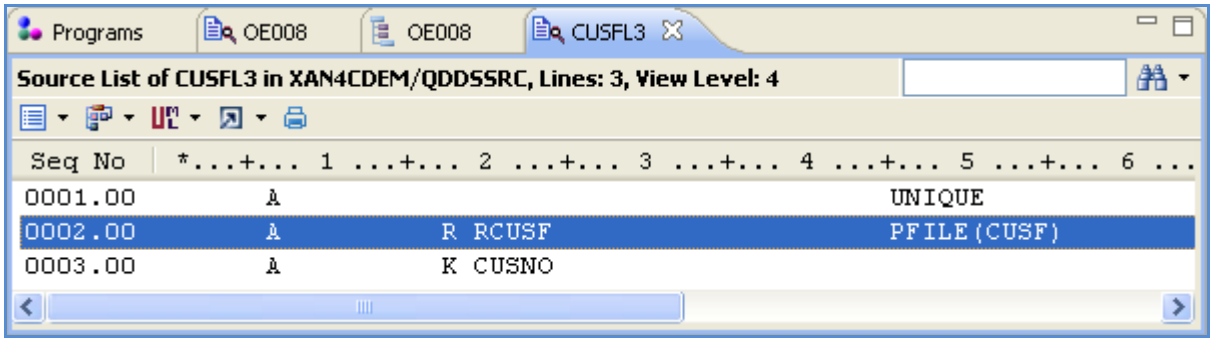
A user can browse the source code of associated files by double clicking on it. Alternatively, select 'CUSFL3' from the Source Browser and opt for context menu. Then select **Zoom Source** option.

Source Browser for the file CUSFL3


Programs
OE008
OE008
CUSFL3
Source List of CUSFL3 in XAN4CDEM/QDDSSRC, Lines: 3, View Level: 4
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0001.00 A UNIQUE
0002.00 A R RCUSF PFILE(CUSF)
0003.00 A K CUSNO

A user can also further drill down to the source code of associated PFILE (CUSF) of the LF 'CUSFL3'.

PFILE selected on the Source Browser for CUSFL3


Programs
OE008
OE008
CUSFL3
Source List of CUSFL3 in XAN4CDEM/QDDSSRC, Lines: 3, View Level: 4
Seq No *...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0001.00 A UNIQUE
0002.00 A R RCUSF PFILE(CUSF)
0003.00 A K CUSNO

Double click on **CUSF** to invoke the Source Browser for the file CUSF.

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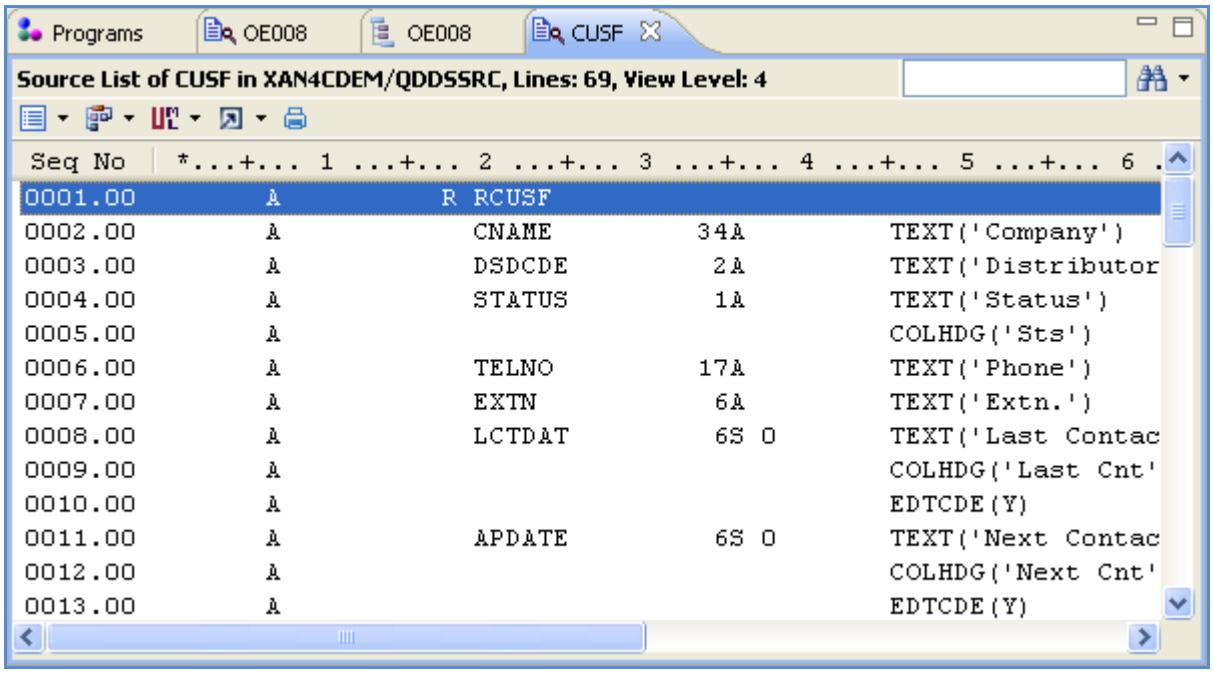
Source Browser for the file CUSF


Programs
OE008
OE008
CUSF
Source List of CUSF in XAN4CDEM/QDDSSRC, Lines: 69, View Level: 4
Seq No
*...+... 1 ...+... 2 ...+... 3 ...+... 4 ...+... 5 ...+... 6
0001.00 A R RCUSF
0002.00 A CNAME 34A TEXT('Company')
0003.00 A DSDCDE 2A TEXT('Distributor
0004.00 A STATUS 1A TEXT('Status')
0005.00 A COLHDG('Sts')
0006.00 A TELNO 17A TEXT('Phone')
0007.00 A EXTN 6A TEXT('Extn.')
0008.00 A LCTDAT 6S 0 TEXT('Last Contac
0009.00 A COLHDG('Last Cnt'
0010.00 A EDTCDE(Y)
0011.00 A APDATE 6S 0 TEXT('Next Contac
0012.00 A COLHDG('Next Cnt'
0013.00 A EDTCDE(Y)

X-Analysis makes the browsing of an application very easy. In the Source Browser a user can go anywhere from anywhere, thereby assisting the user to drill down to a particular feature, resulting in a better understanding of the application.

Let us now move on to some other features available on the source browser. Bring up the Source Browser for the program OE008.

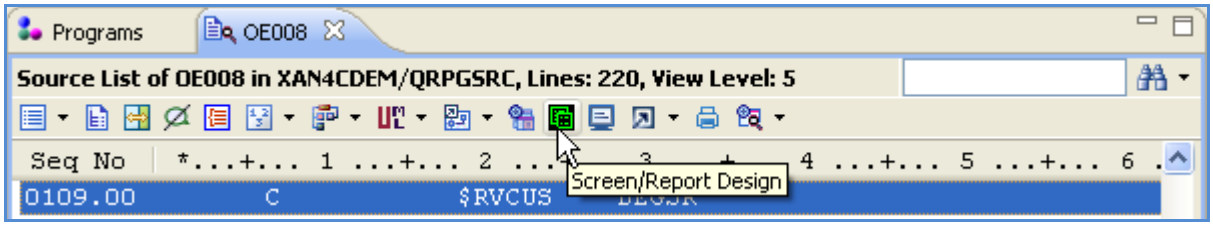
Screen Design

Most of the application programs interact either with display files or with printer files (DSPFs/PRTFs). The Source Browser provides a feature to view layout of the associated display/ printer files.

Note this feature does not require the execution of an actual program.

Click the **Screen/Report Design** icon available on the Source Browser.

Screen Design option on the Source Browser



This brings up the 'Screen Design' window for the program OE008.

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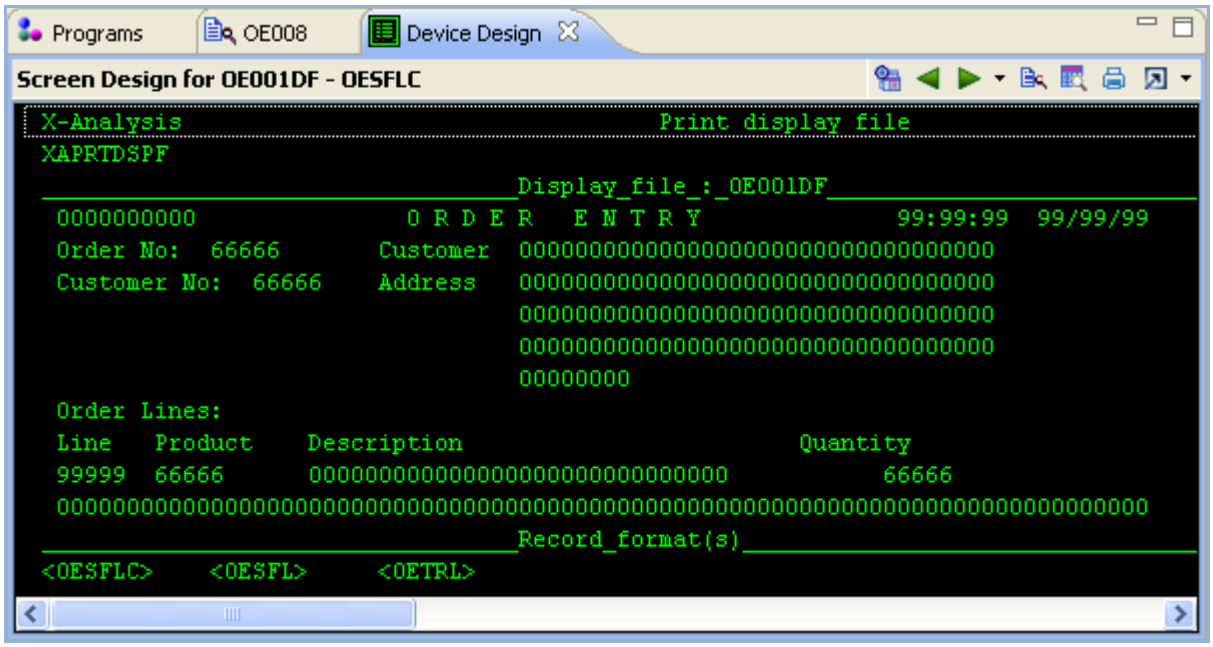
Screen Design option for the program OE008



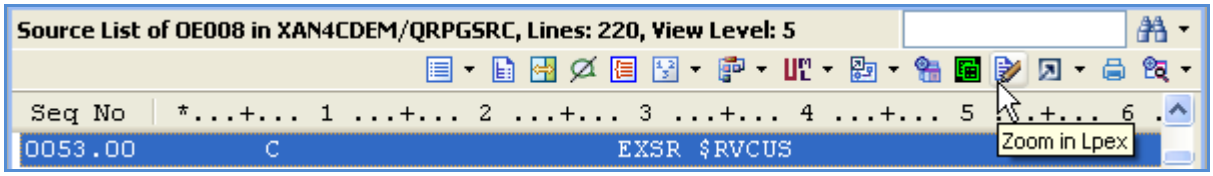
Navigate back to the Source Browser for the program OE008 using the back navigation arrow.

Zoom Source in SEU / Lpex Editor

Lpex Editor

A user can make changes to the source code using the 'Zoom in Lpex' option. Click the **Zoom in Lpex** icon available on the Source Browser Toolbar.

Zoom in Lpex option on the Source Browser



This invokes the Lpex editor from within the X-Analysis Perspective.

SEU

A user can make changes to the source code using the 'SEU' option. Click the **SEU** icon available on the Source Browser Toolbar.

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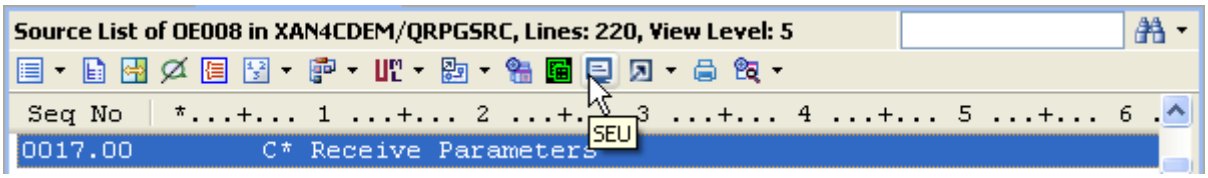
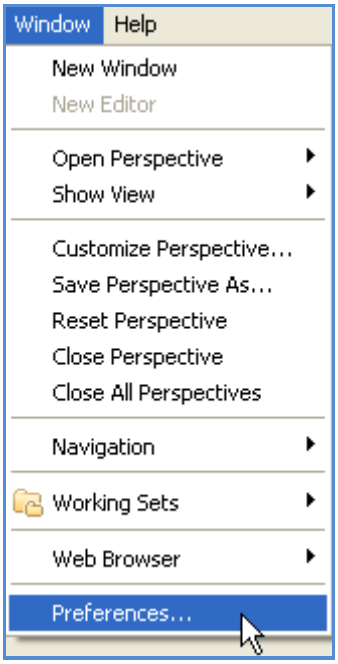
Invoke SEU option from the Source Browser



'Zoom in Lpex' is a default option for all IBM Rational products having an RSE plugin. For all other eclipse products, SEU (5250 emulator) is the default option. A user can change the default settings using the X-Analysis 'General Preferences' option. Creating a SEU (5250 emulator) session requires the user XAN4SEU IBM i. Please refer to Appendix A for creating the user XAN4SEU.

The X-Analysis Plugin comes with default preference settings. To change the preference settings, Start IBM's RDi / RDp / WDSC/ or Eclipse 3.2 (and above), then select **Windows > Preferences** to display the Preferences dialog.

Preferences option



To view / modify various X-Analysis Preferences, select **X-Analysis** node.

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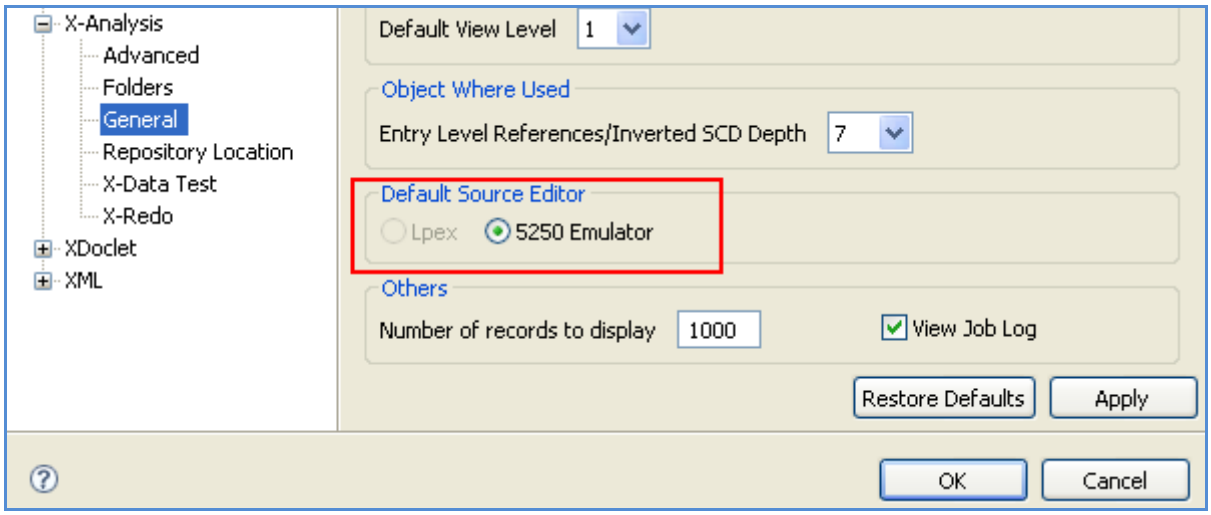
General X-Analysis Preferences Settings



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Chapter 4: Data Modeling

In the previous chapter, we learnt how X-Analysis helps to convert existing application's design into current acceptable application format. However, proper understanding of an application's design depends on an accurate data model. The term 'model' encompasses the foreign key or the relational model, and not the usual physical model of the database. X-Analysis derives the legacy data model by analyzing the data structures of the physical and logical files. Moreover, it maps data structures in all the programs further verifying the presence of cross-file relationships or foreign keys. X-Analysis programmatically works in a two-pronged manner, from the parent file to the dependent, enabling users to extract data models from even the most complicated, or redundant legacy system.

X-Analysis is fully loaded with the advanced capability of automatically extracting data model from an RPG/COBOL based application. This Data Modeling tool set is innovatively devised to forego the cumbersome task of reading millions of RPG or COBOL codes in order to recover a single relational model. Through X-Analysis, the data model is viewable as an interactive diagram. The software extends the benefit of perusing the file-centric or application area specific filtering of the diagram. The colour-coded relationships between each entity help you learn their exact nature. You can also take a print of the detailed report, if you need to.

The chapter highlights the importance of understanding an application's design and describes how the Data Modeling solution set helps in deciphering complicated codes of databases. The advanced tool accomplishes this to further its objective of extending automated solutions for data maintenance and development work.

The chapter contains:

- Generating Data Model Diagram
- LFs/Access Paths
- File Field Details
- Access Path Diagram
- View Data

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The Data Modelling solution set is an add-on module dedicated to data model extraction. While analyzing a legacy system it is important to understand the application's design. An analyst looks for the implicit Data Model information of the legacy system, which is the foundation of the application's design.

In the context of X-Analysis, the term Data Model not only refers to the physical model of a database design but also refers to the foreign key or the relational model.

X-Analysis automatically derives an explicit physical & logical data model by analyzing both, the actual data and the programs that use that data, to verify the existence of any cross-file relationships. X-analysis verifies these potential relationships by performing an integrity check to ensure that all data from dependant file validly refers to the data records from the owning file.

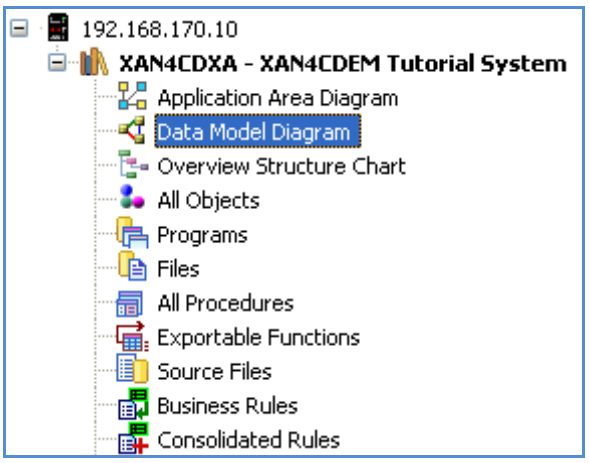
A complete data model accurately describing all possible relationships between each file is essential for productive maintenance and development work. Such a model also provides a foundation to automate critical data administration tasks such as referential integrity testing and test data extraction.

The graphical representation of automatically generated Data Model information in X-Analysis is a 'Data Model Diagram'. The 'Data Model Diagram' displays file relationships for an Application or an Application Area.

Generating Data Model Diagram

Double click on **Data Model Diagram** node under the cross-reference library 'XAN4CDXA' to display the Data Model Diagram dialog

Data Model Diagram option



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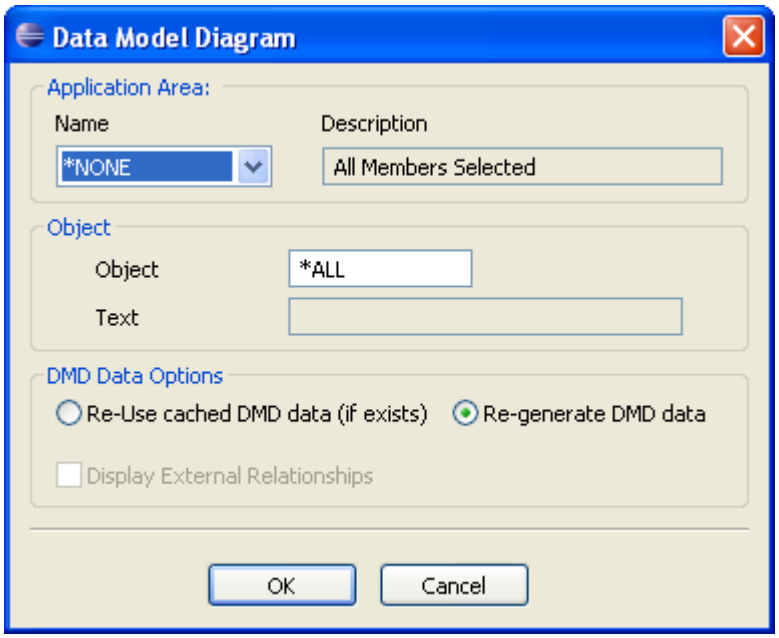
Data Model Diagram dialog



It prompts a user to input the following:

1. Application Area Name (leave it as *NONE)
2. Object Name (leave it as *ALL)
3. The Data Model Diagram option to reuse cached data or regenerate data (leave it as Re-Generate Data Model Diagram Data)
4. Whether to display external relationships (available only when Data Model Diagram opted on Application Area)

Then click the **OK** button to generate Data Model Diagram for the entire application.

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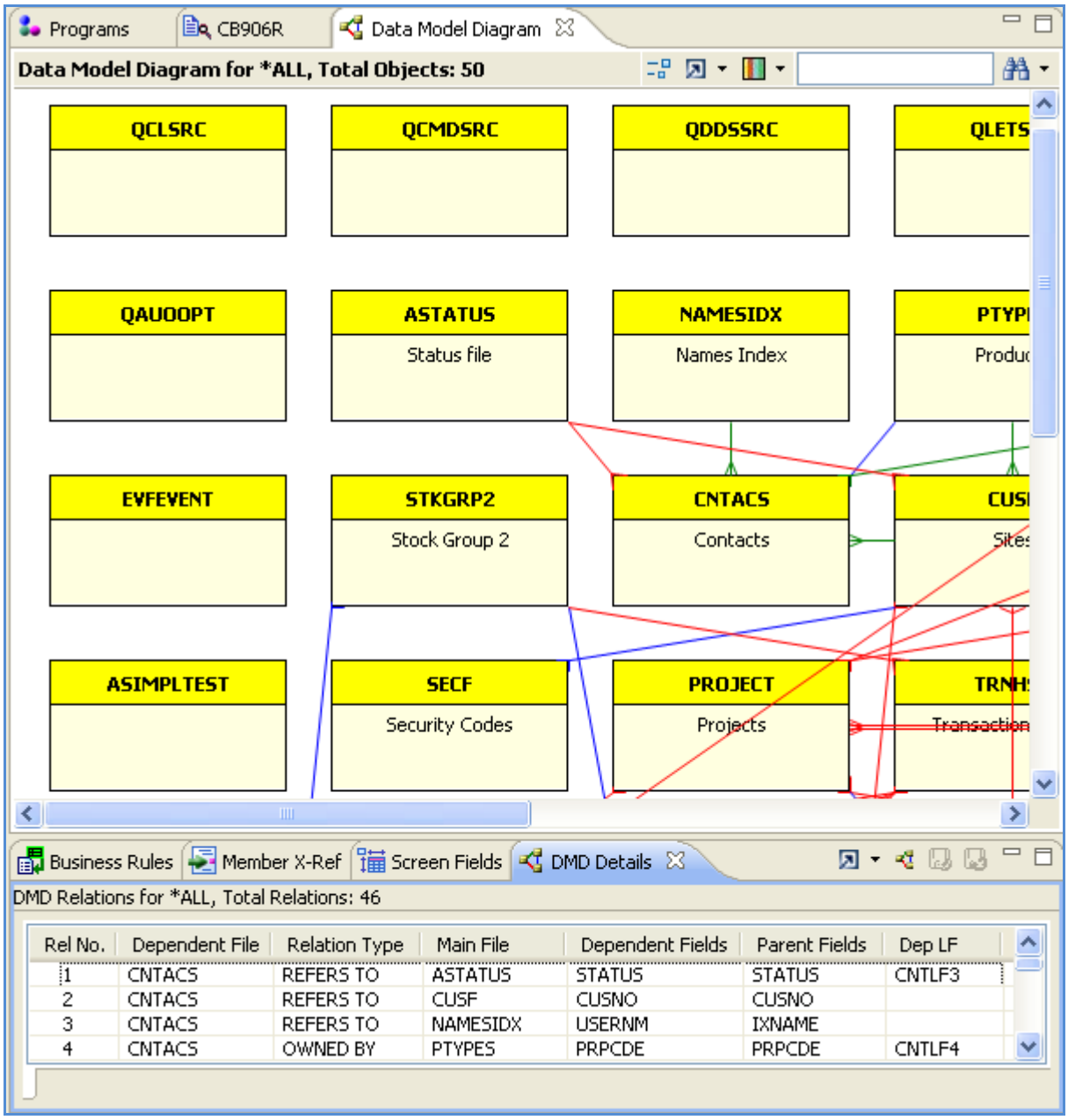
Data Model Diagram for entire Application (XAN4CDXA)



The ‘Data Model Diagram’ displayed above consists of two halves. The upper half is the ‘Data Model Diagram’ and the lower half is the ‘DMD Details’ view.

The ‘Data Model Diagram’ displays a graphical representation of the derived data model information.

The Data Model Diagram toolbar has a **Legend** icon where different colours on the ‘Legend’ dropdown convey the type of association represented by the coloured lines that connect various files.

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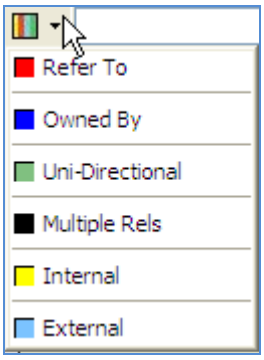
DMD Legend

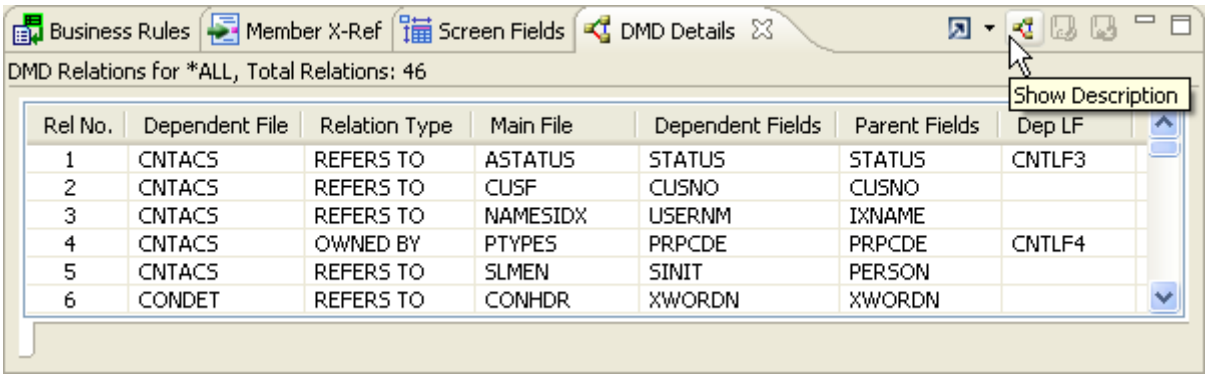


With the help of the DMD legend, a user can easily understand the relations displayed on the 'Data Model Diagram'.

The 'DMD Details' view displays the Files Connection Details. On the DMD details view, the column 'Relation Type' gives the relationship between the files in the 'Dependent File' column and the files in the 'Parent File' column. The 'Dependent Fields' and the 'Parent Fields' columns list the fields which relate to the 'Dependent File' and the 'Parent File' respectively.

The DMD Details list displays actual names of the listed Files and Fields. The DMD details list provides a toggle button, 'Show Description', to switch the DMD details list to display the description of the listed Files and Fields.

DMD Details view with Show Description icon



Rel No.	Dependent File	Relation Type	Main File	Dependent Fields	Parent Fields	Dep LF
1	CNTACS	REFERS TO	ASTATUS	STATUS	STATUS	CNTLF3
2	CNTACS	REFERS TO	CUSF	CUSNO	CUSNO	
3	CNTACS	REFERS TO	NAMESIDX	USERNM	IXNAME	
4	CNTACS	OWNED BY	PTYPES	PRPCDE	PRPCDE	CNTLF4
5	CNTACS	REFERS TO	SLMEN	SINIT	PERSON	
6	CONDET	REFERS TO	CONHDR	XWORDN	XWORDN	

Click the **Show Description** icon to see descriptive names for all the files and the fields.

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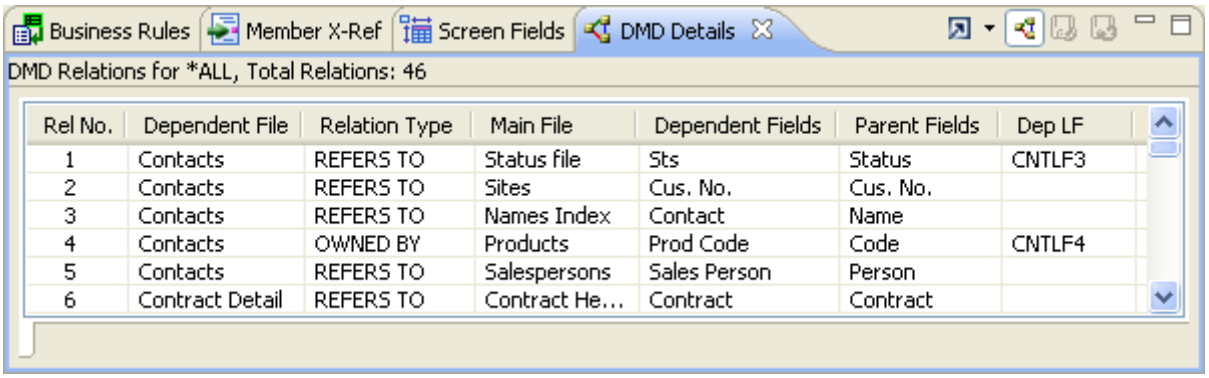
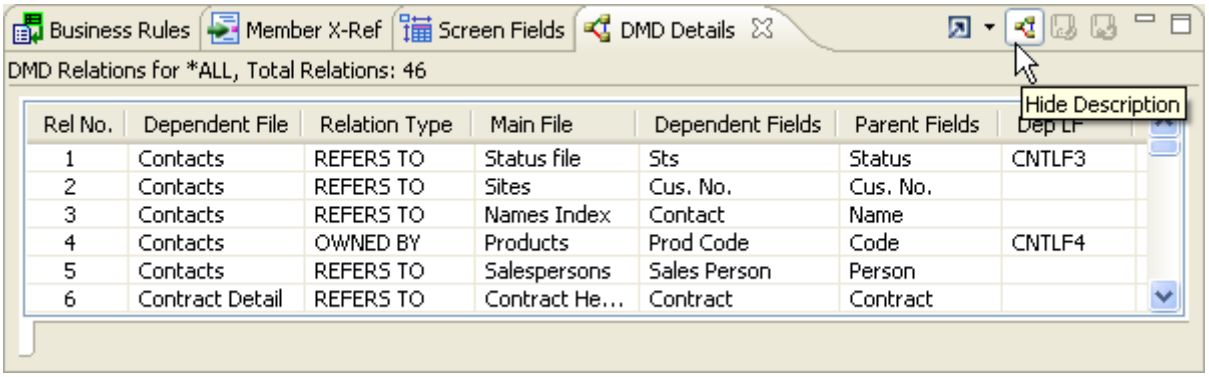
DMD Details view with Description



Rel No.	Dependent File	Relation Type	Main File	Dependent Fields	Parent Fields	Dep LF
1	Contacts	REFERS TO	Status file	Sts	Status	CNTLF3
2	Contacts	REFERS TO	Sites	Cus. No.	Cus. No.	
3	Contacts	REFERS TO	Names Index	Contact	Name	
4	Contacts	OWNED BY	Products	Prod Code	Code	CNTLF4
5	Contacts	REFERS TO	Salespersons	Sales Person	Person	
6	Contract Detail	REFERS TO	Contract He...	Contract	Contract	

Click the **Hide Description** icon to switch back the DMD Details list to actual names mode.

DMD Details view with Hide Description icon



Rel No.	Dependent File	Relation Type	Main File	Dependent Fields	Parent Fields	Dep LF
1	Contacts	REFERS TO	Status file	Sts	Status	CNTLF3
2	Contacts	REFERS TO	Sites	Cus. No.	Cus. No.	
3	Contacts	REFERS TO	Names Index	Contact	Name	
4	Contacts	OWNED BY	Products	Prod Code	Code	CNTLF4
5	Contacts	REFERS TO	Salespersons	Sales Person	Person	
6	Contract Detail	REFERS TO	Contract He...	Contract	Contract	

Let us now move on to another aspect of data model diagram. A single click on an object, displays the references of that object with other objects in the 'Data Model Diagram'. Click on the object - **CUSF** to view its references.

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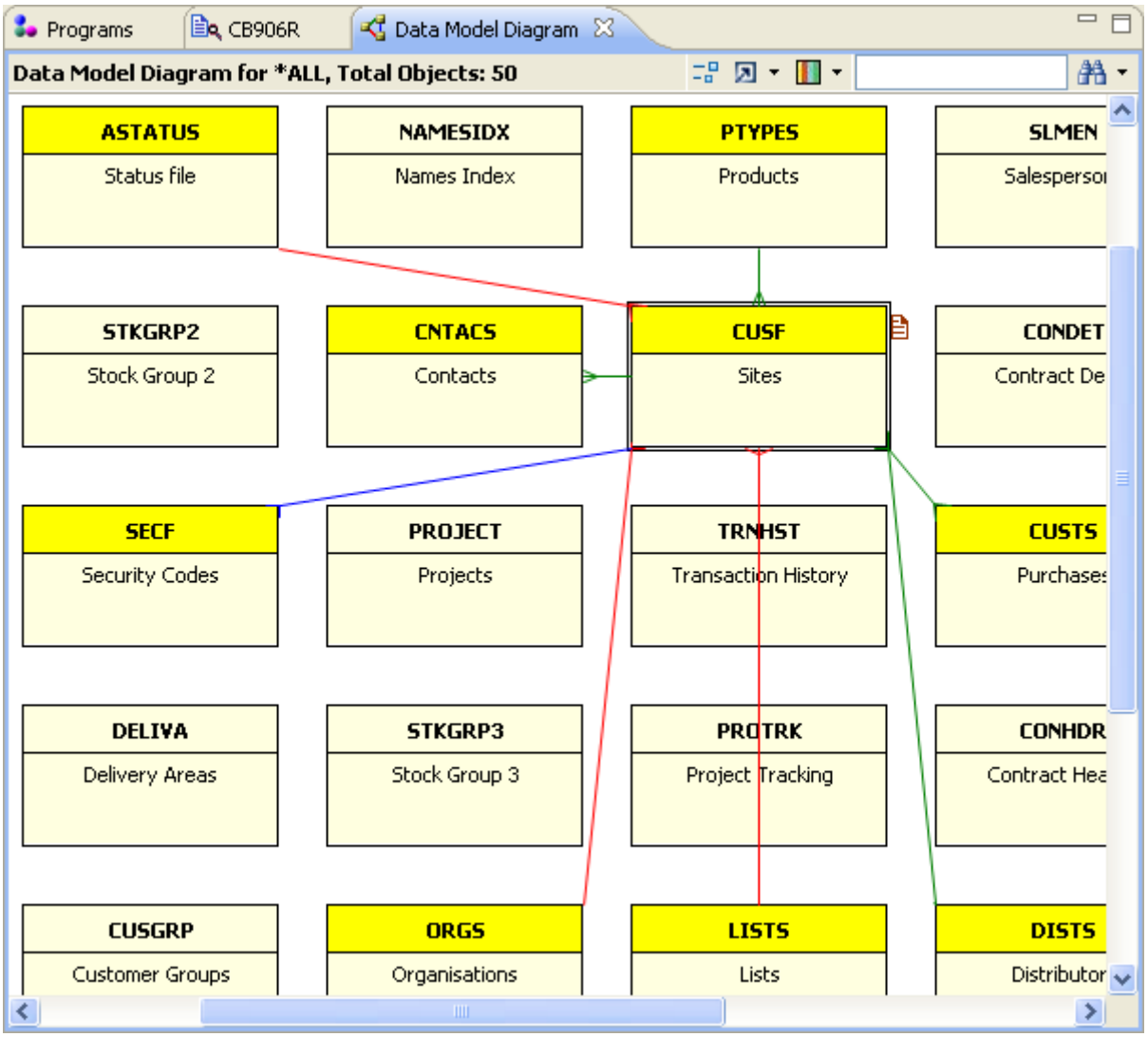
Data Model Diagram with the selected object CUSF



The screen above displays relations for the file CUSF. This helps a user to make out all the relationships for any selected object. Another way of understanding file relations for any specific file is to have a file specific Data Model Diagram. A file specific Data Model Diagram displays the data model information for a given file only. Double click on **CUSF** to get the file specific Data Model Diagram.

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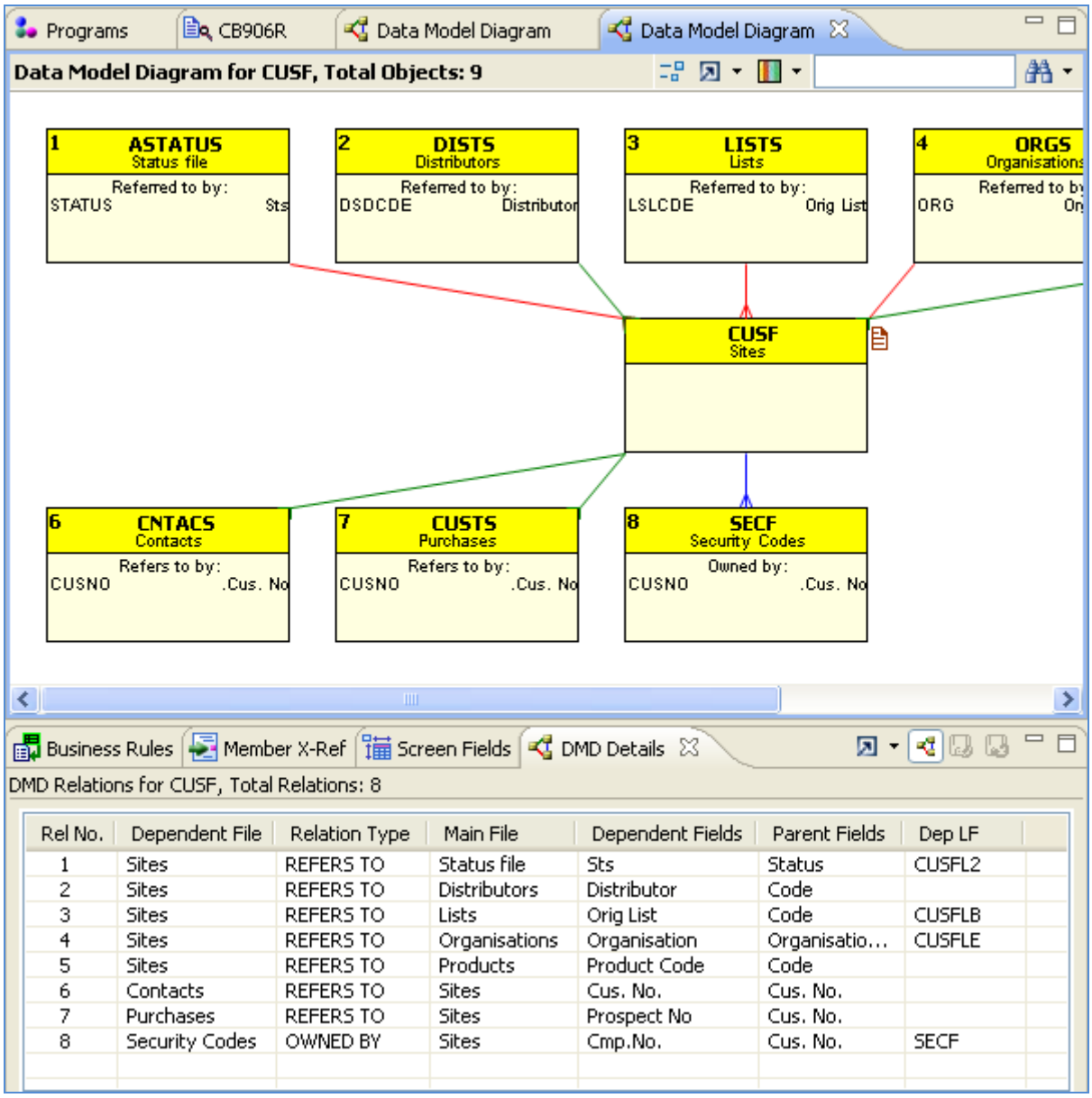
File Specific Data Model Diagram for CUSF



Rel No.	Dependent File	Relation Type	Main File	Dependent Fields	Parent Fields	Dep LF
1	Sites	REFERS TO	Status file	Sts	Status	CUSFL2
2	Sites	REFERS TO	Distributors	Distributor	Code	
3	Sites	REFERS TO	Lists	Orig List	Code	CUSFLB
4	Sites	REFERS TO	Organisations	Organisation	Organisatio...	CUSFLE
5	Sites	REFERS TO	Products	Product Code	Code	
6	Contacts	REFERS TO	Sites	Cus. No.	Cus. No.	
7	Purchases	REFERS TO	Sites	Prospect No	Cus. No.	
8	Security Codes	OWNED BY	Sites	Cmp.No.	Cus. No.	SECF

The Data Model Diagram displayed above is a file specific Data Model Diagram for CUSF. It only has objects related to the file CUSF. Furthermore, the Data Model Diagram Details list displays only those relationships related to the file CUSF.

With the help of a file specific Data Model Diagram, a user can view relations for any available files. These relations can be understood better, when we talk about them in the 'View Data' section.

LFs/Access Paths

A user can opt for the LFs/Access Paths option for a file from the Data Model Diagram. The 'LFs/Access Paths' option shows all access paths associated with a selected file.

Select file CUSF and then select **LFs/Access Paths** option from the context menu.

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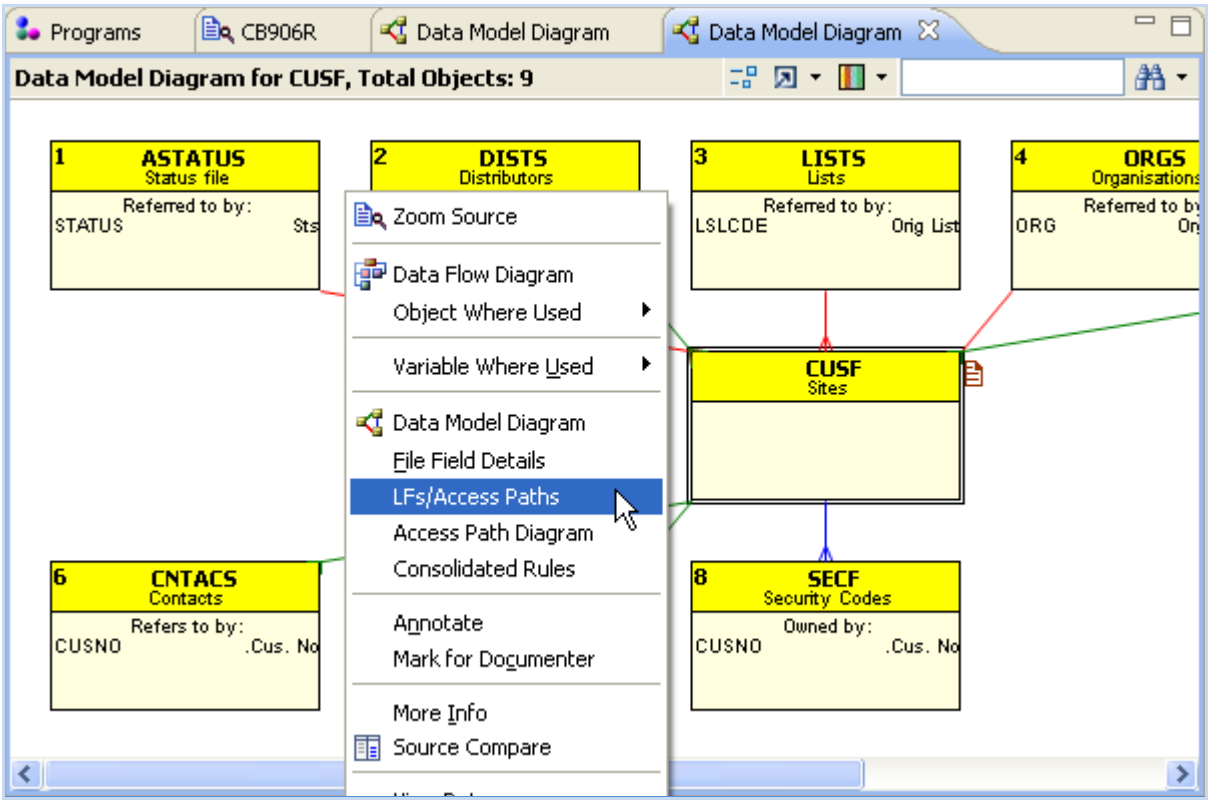
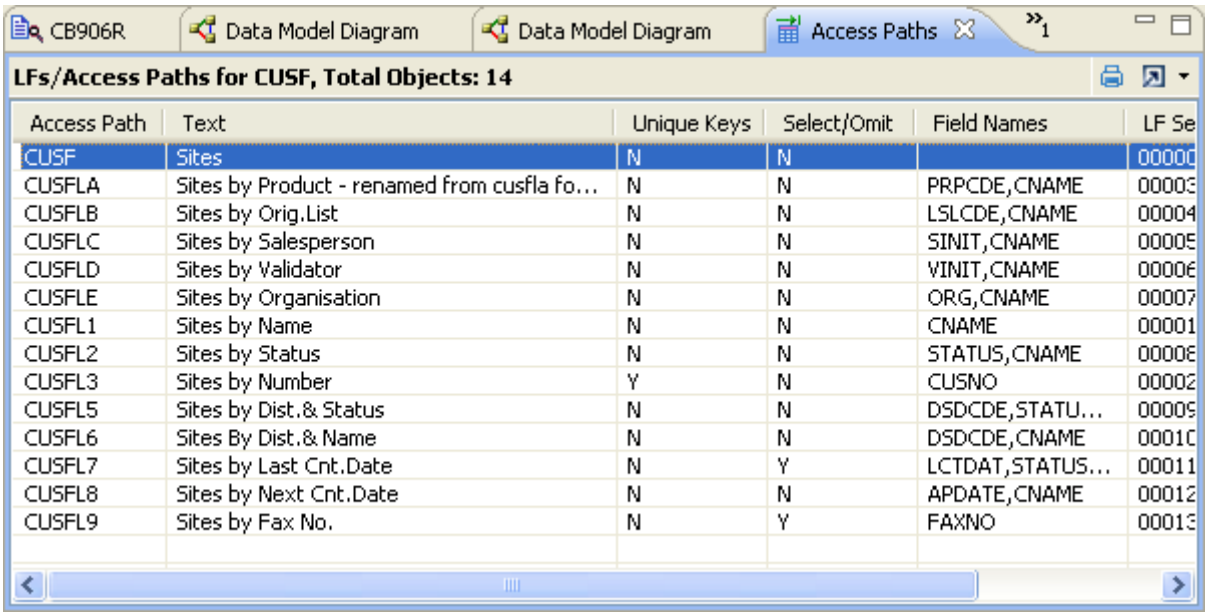
LFs/Access Paths option on DMD



This brings up the Access Path list.

LFs/Access Paths for the file CUSF



Access Path	Text	Unique Keys	Select/Omit	Field Names	LF Se
CUSF	Sites	N	N		00000
CUSFLA	Sites by Product - renamed from cusfla fo...	N	N	PRPCDE,CNAME	00003
CUSFLB	Sites by Orig.List	N	N	LSLCDE,CNAME	00004
CUSFLC	Sites by Salesperson	N	N	SINIT,CNAME	00005
CUSFLD	Sites by Validator	N	N	VINIT,CNAME	00006
CUSFLE	Sites by Organisation	N	N	ORG,CNAME	00007
CUSFL1	Sites by Name	N	N	CNAME	00001
CUSFL2	Sites by Status	N	N	STATUS,CNAME	00008
CUSFL3	Sites by Number	Y	N	CUSNO	00002
CUSFL5	Sites by Dist.& Status	N	N	DSDCDE,STATU...	00009
CUSFL6	Sites By Dist.& Name	N	N	DSDCDE,CNAME	0001C
CUSFL7	Sites by Last Cnt.Date	N	Y	LCTDAT,STATUS...	00011
CUSFL8	Sites by Next Cnt.Date	N	N	APDATE,CNAME	00012
CUSFL9	Sites by Fax No.	N	Y	FAXNO	00013

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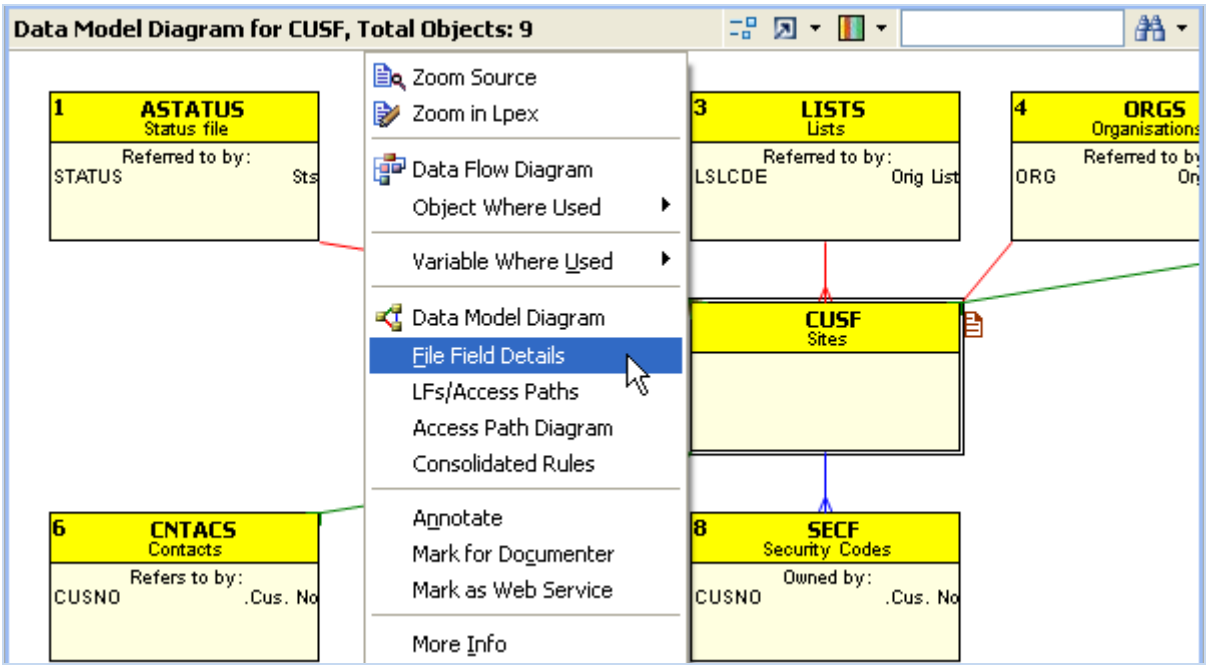
File Field Details / FFD

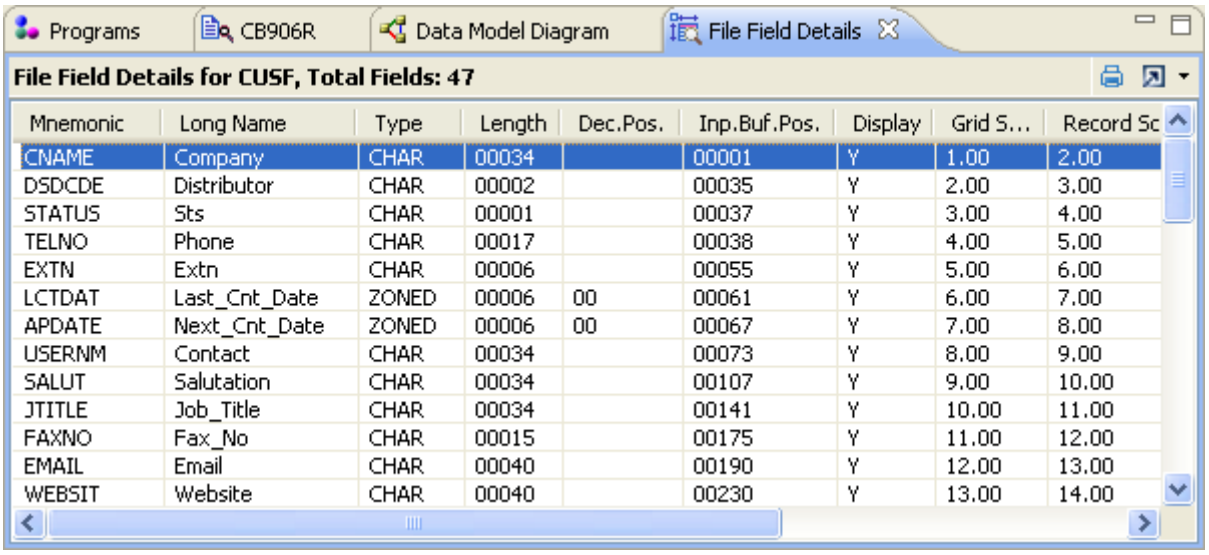
As part of understanding the data model of an existing application, a user needs more details of a particular file. A particular file may consist of several fields. The FFD option helps the user here. By choosing the aforementioned option from the context menu, the user gains easy access to particular field details of a selected file - CUSF.

File Field Details option



Now a new window appears displaying File Field Details information.

File Fields Details for the file CUSF



Mnemonic	Long Name	Type	Length	Dec.Pos.	Inp.Buf.Pos.	Display	Grid S...	Record Sc
CNAME	Company	CHAR	00034		00001	Y	1.00	2.00
DSDCDE	Distributor	CHAR	00002		00035	Y	2.00	3.00
STATUS	Sts	CHAR	00001		00037	Y	3.00	4.00
TELNO	Phone	CHAR	00017		00038	Y	4.00	5.00
EXTN	Extn	CHAR	00006		00055	Y	5.00	6.00
LCTDAT	Last_Cnt_Date	ZONED	00006	00	00061	Y	6.00	7.00
APDATE	Next_Cnt_Date	ZONED	00006	00	00067	Y	7.00	8.00
USERNM	Contact	CHAR	00034		00073	Y	8.00	9.00
SALUT	Salutation	CHAR	00034		00107	Y	9.00	10.00
JTITLE	Job_Title	CHAR	00034		00141	Y	10.00	11.00
FAXNO	Fax_No	CHAR	00015		00175	Y	11.00	12.00
EMAIL	Email	CHAR	00040		00190	Y	12.00	13.00
WEBSIT	Website	CHAR	00040		00230	Y	13.00	14.00

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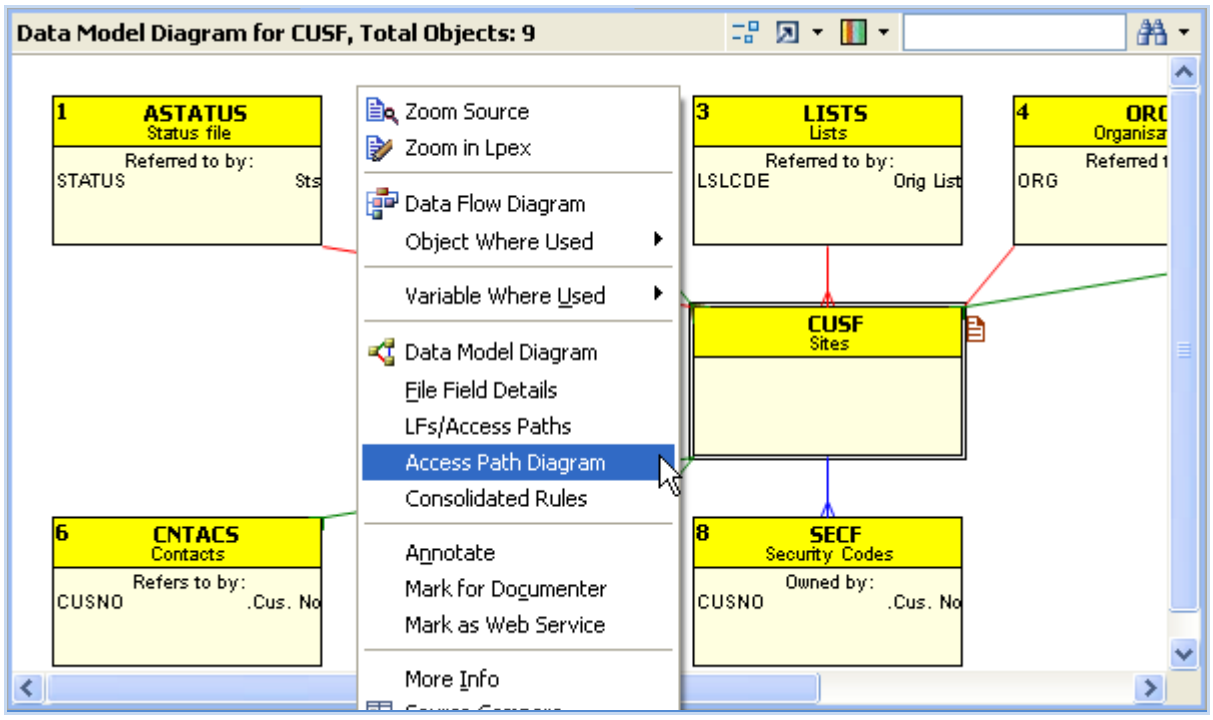
Access Path Diagram / APD

APD is a graphical presentation of all access paths related to a specific file. The diagram can be generated by simply choosing the Access Path Diagram option from the context menu over a selected file - CUSF.

Access Path Diagram option on DMD



This brings up the ‘Access Path Diagram’ for the file CUSF.

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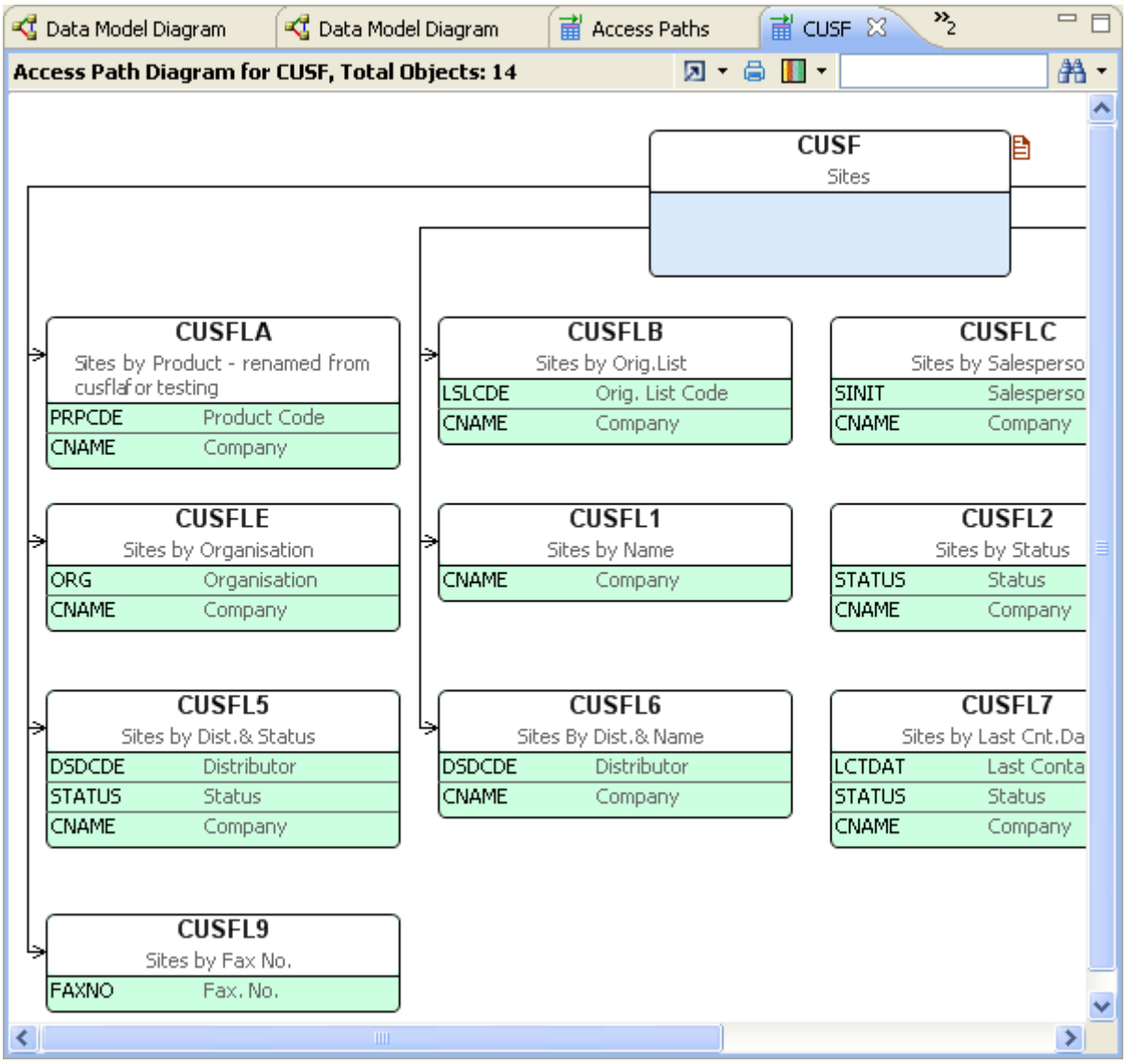
Access Path Diagram for the file CUSF



Go back to the Data Model Diagram displaying the file specific Data Model Diagram for the object CUSF.

View Data

X-Analysis allows a user to view file records from an application's data model. A user can view the actual records held in PFs using the 'View Data' option. The 'View Data' option is available on all objects displayed in the Data Model Diagram.

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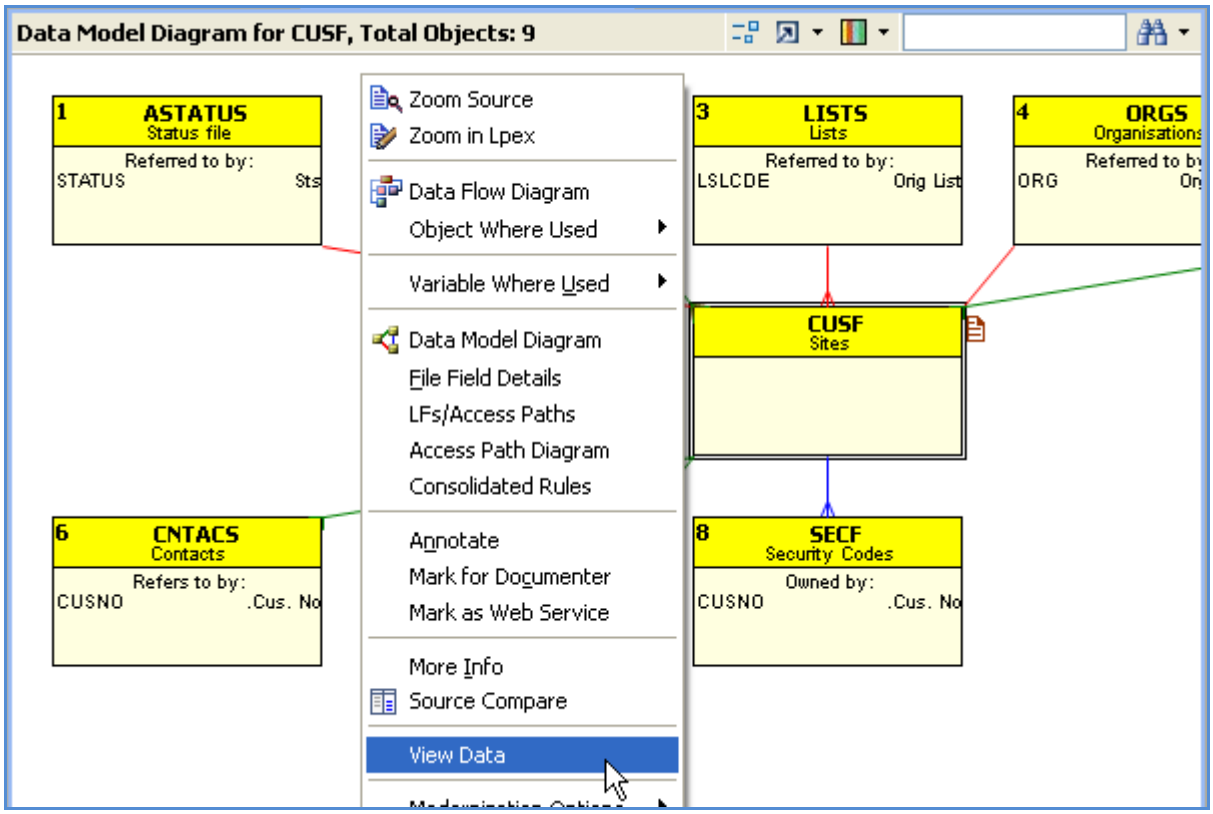
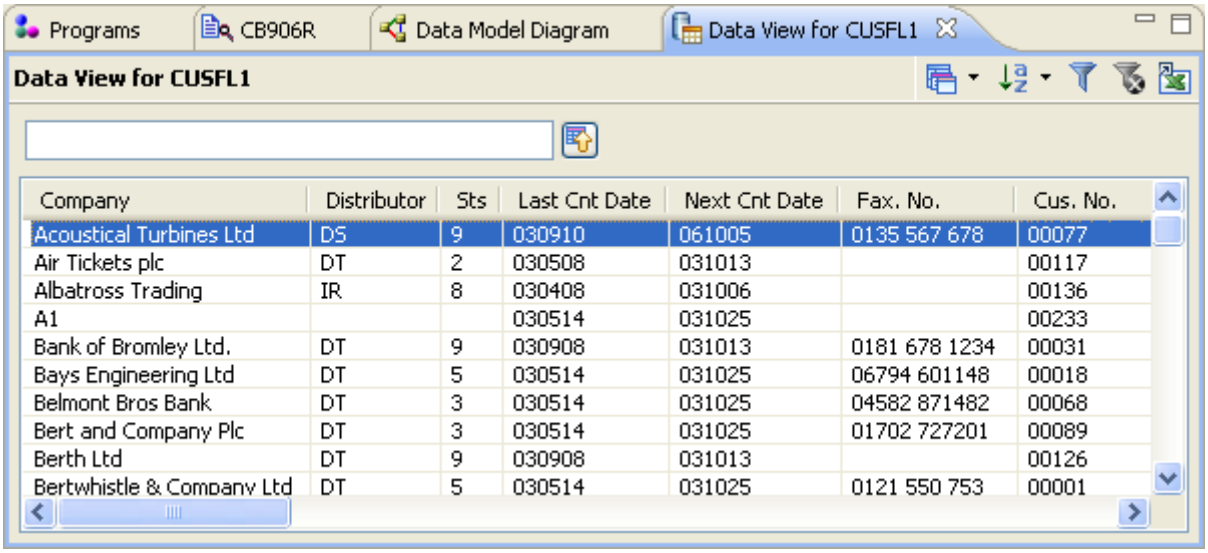
View Data option on the DMD object



Data View for the file CUSF



Company	Distributor	Sts	Last Cnt Date	Next Cnt Date	Fax. No.	Cus. No.
Acoustical Turbines Ltd	DS	9	030910	061005	0135 567 678	00077
Air Tickets plc	DT	2	030508	031013		00117
Albatross Trading	IR	8	030408	031006		00136
A1			030514	031025		00233
Bank of Bromley Ltd.	DT	9	030908	031013	0181 678 1234	00031
Bays Engineering Ltd	DT	5	030514	031025	06794 601148	00018
Belmont Bros Bank	DT	3	030514	031025	04582 871482	00068
Bert and Company Plc	DT	3	030514	031025	01702 727201	00089
Berth Ltd	DT	9	030908	031013		00126
Bertwhistle & Company Ltd	DT	5	030514	031025	0121 550 753	00001

Record Display

The 'View Data' window lists records for a selected file. Double click on a record to display the complete record.

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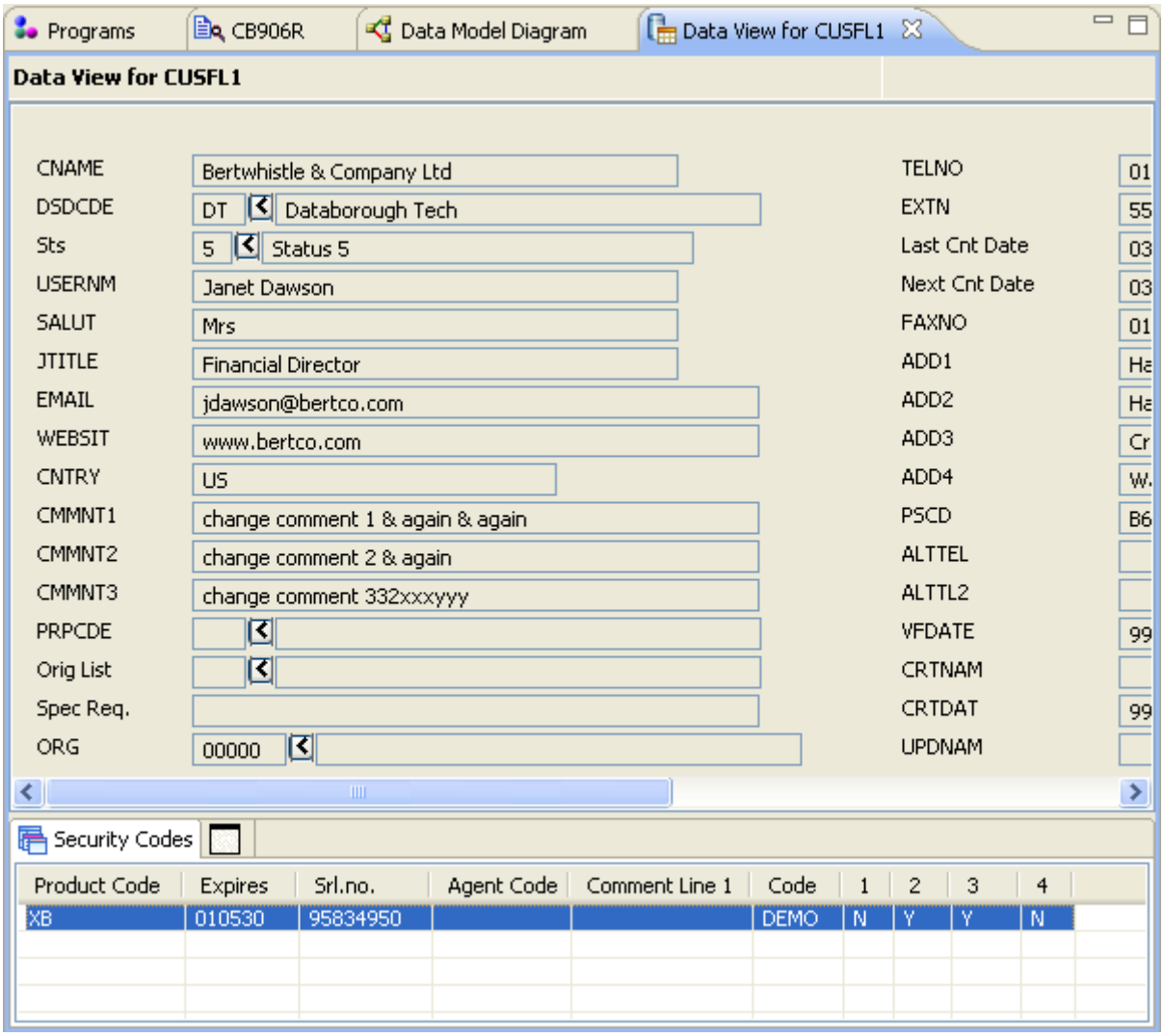
Double click on the record - **Bertwhistle & Company Ltd**. This brings up the record display along with its dependent files data.

Record Display with Dependents



The tab at the bottom displays dependent file data. These are any ACCESSES/OWNS/REFERS TO relationships for the file CUSF in the Data Model Diagram.

On the record display, the descriptor button displays the ACCESSED BY / REFERS TO relations. This is similar to a JOIN to a foreign file, to get the description for the code used from the Master/Owning file.

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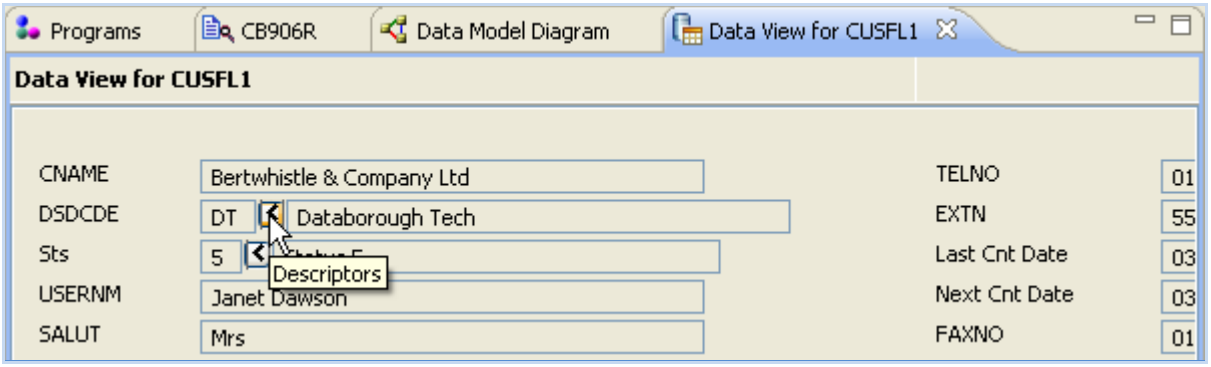
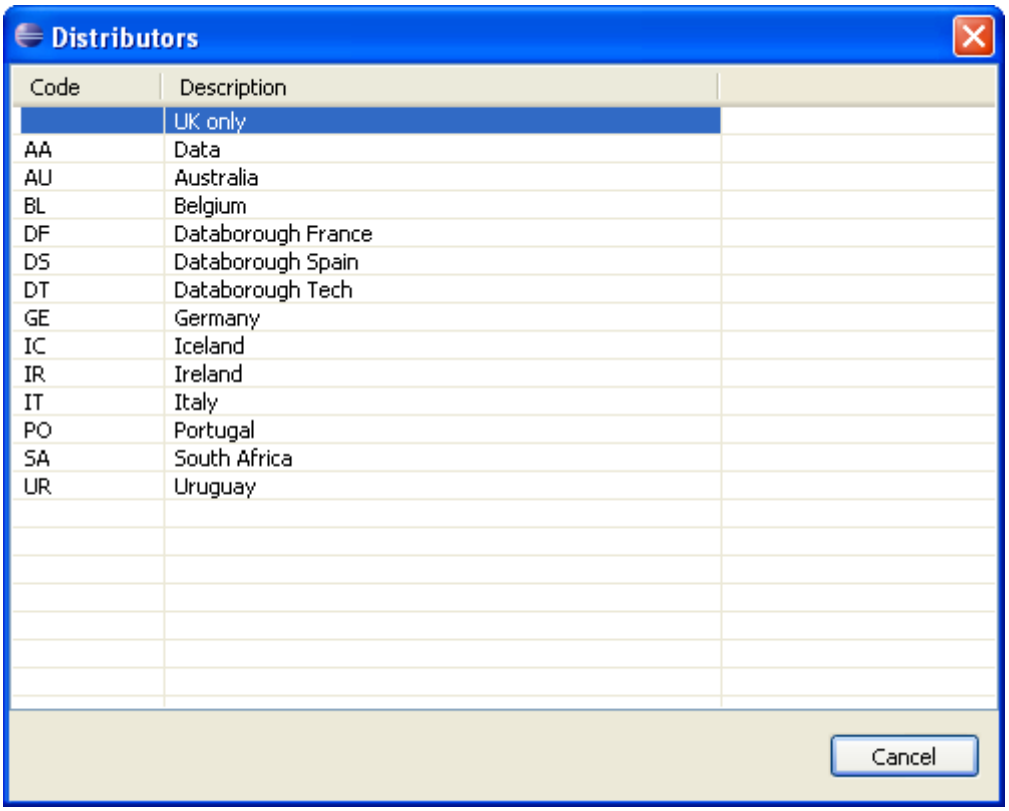
Descriptors Button on record display



Window presenting Descriptors from Master/Owning file



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Chapter 5: Business Rules Analysis

This chapter tells you about the Business Rule Analysis solution set. In addition, the chapter tells you how X-Analysis expedites the analytical procedures using its host of refined features.

The chapter contains:

- Application Areas
- Application Area Diagram
- Area Flow Diagram: Application Area Specific
- Data Model Diagram: Application Area Specific
- Data Flow Diagram: Application Area Specific
- Business Rules
- Consolidated Rules

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The Business Rules Analysis solution set addresses the requirement of isolating, indexing, and documenting the design elements of a legacy application that are relevant in a modern version of application. Before this tutorial explains Business Rules, it is important to see how X-Analysis helps in analyzing a monolithic legacy application by breaking it down into different sub areas for the ease of working.

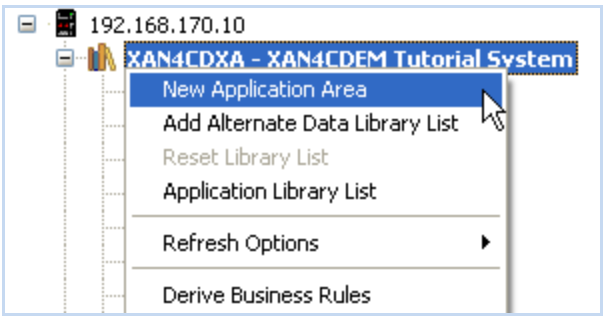
Application Areas

X-Analysis creates application areas, from part of one or multiple systems. It is possible to subdivide, programmatically an application into logical modules or areas. This can be within the context of a single system or specific parts from multiple systems. For example, a user can have an application area as ORDERS, containing the Order Entry details from an Operational System to represent single system application areas. A user can also have an application area as ACCOUNTS, containing the Order Entry details from an Operational System and the Sales Ledger details from the Financial System, representing the application area as specific parts from multiple systems.

'Application areas' facilitate grouping of an application into different business areas. X-Analysis creates application areas based on certain criteria – called Application Area Rules. Hence, Application Area Rules are a useful mechanism to categorize an application into different application areas.

A user can add a new application area by selecting the 'New Application Area' option from the context menu in a cross-reference library or in an application area.

New Application Area option



The tutorial application contains pre-configured application areas. The following screenshot displays the available application areas in the tutorial application:

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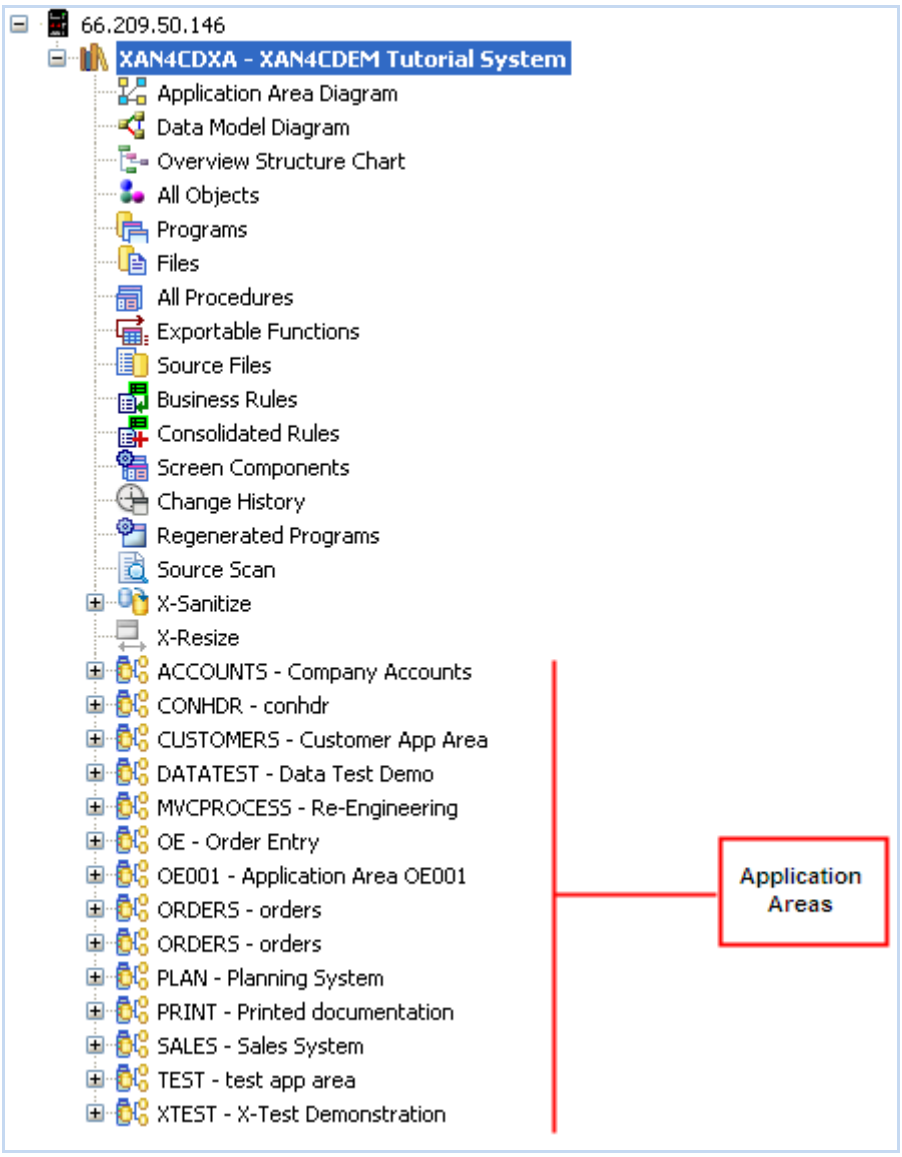
Application Areas under XAN4CDXA



Application Area Diagram

A user can easily sub divide an application into business areas or application areas using X-Analysis. Similarly, a user can further split application areas into sub application areas for better application analysis. For ease of analyzing application areas, X-Analysis provides another diagrammatic construct called the ‘Application Area Diagram’.

The ‘Application Area Diagram’ helps in visualizing relationships between the application areas. When the option ‘Application Area Diagram’ is opted for entire cross-reference library, it displays all application areas and the sub-application areas (if available). The following screenshot displays the ‘Application Area Diagram’ for the tutorial application.

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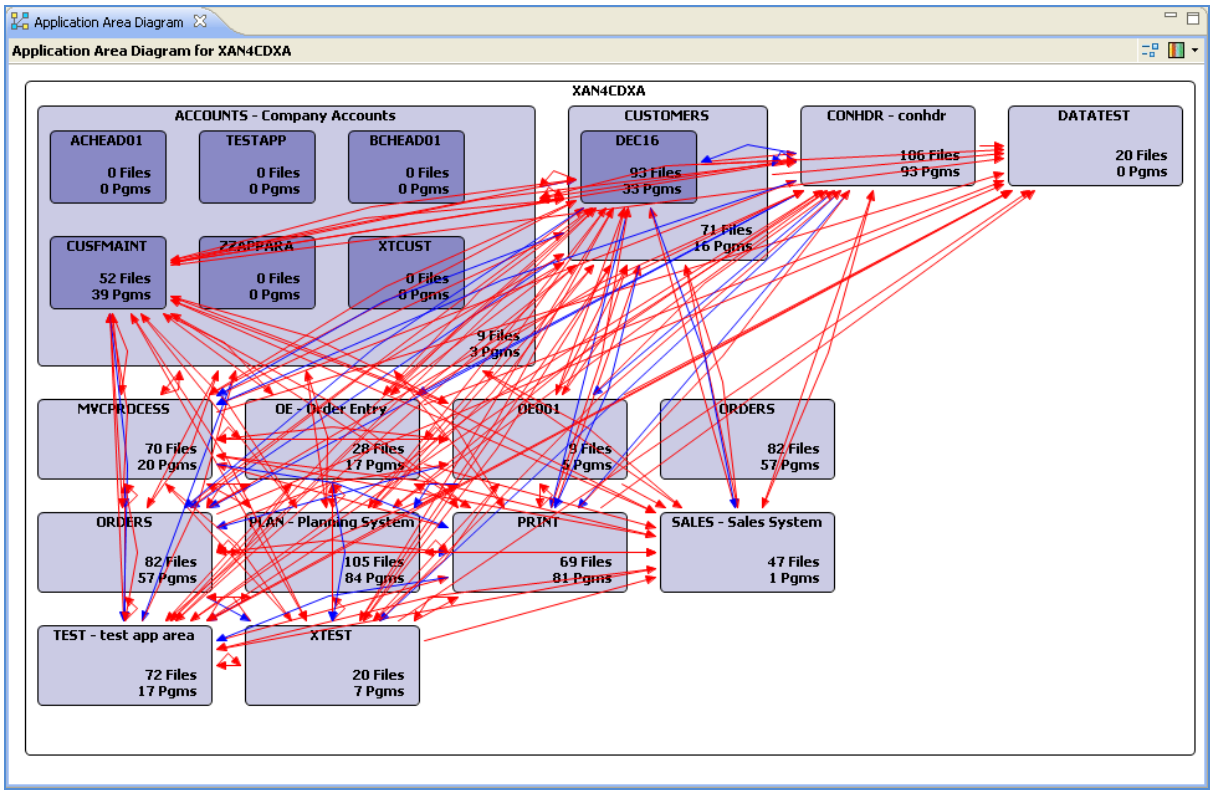
Application Area Diagram for XAN4CDXA



Each bluish grey block represents an application area. The size of a box is indicative of the number of objects it contains. A larger box has more objects as compared to a smaller box.

The diagram also shows relationships between application areas, displayed by selecting an application area. Select an application area to test this feature.

The red and blue coloured connecting arrows are the relationships between application areas.

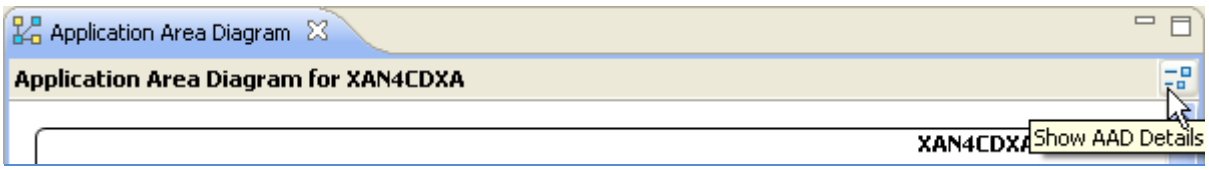
Blue Arrows - Indicate Program-to-Program calls. The blue arrow points towards the application area, which has more calling programs.

Red Arrows – Indicate Program-to-File references.

Application Area Diagram Details

The 'Application Area Diagram' also displays relationship details for each application area. Click the **Show AAD Details** icon, available on toolbar, to invoke the detailed view.

Show AAD Details icon



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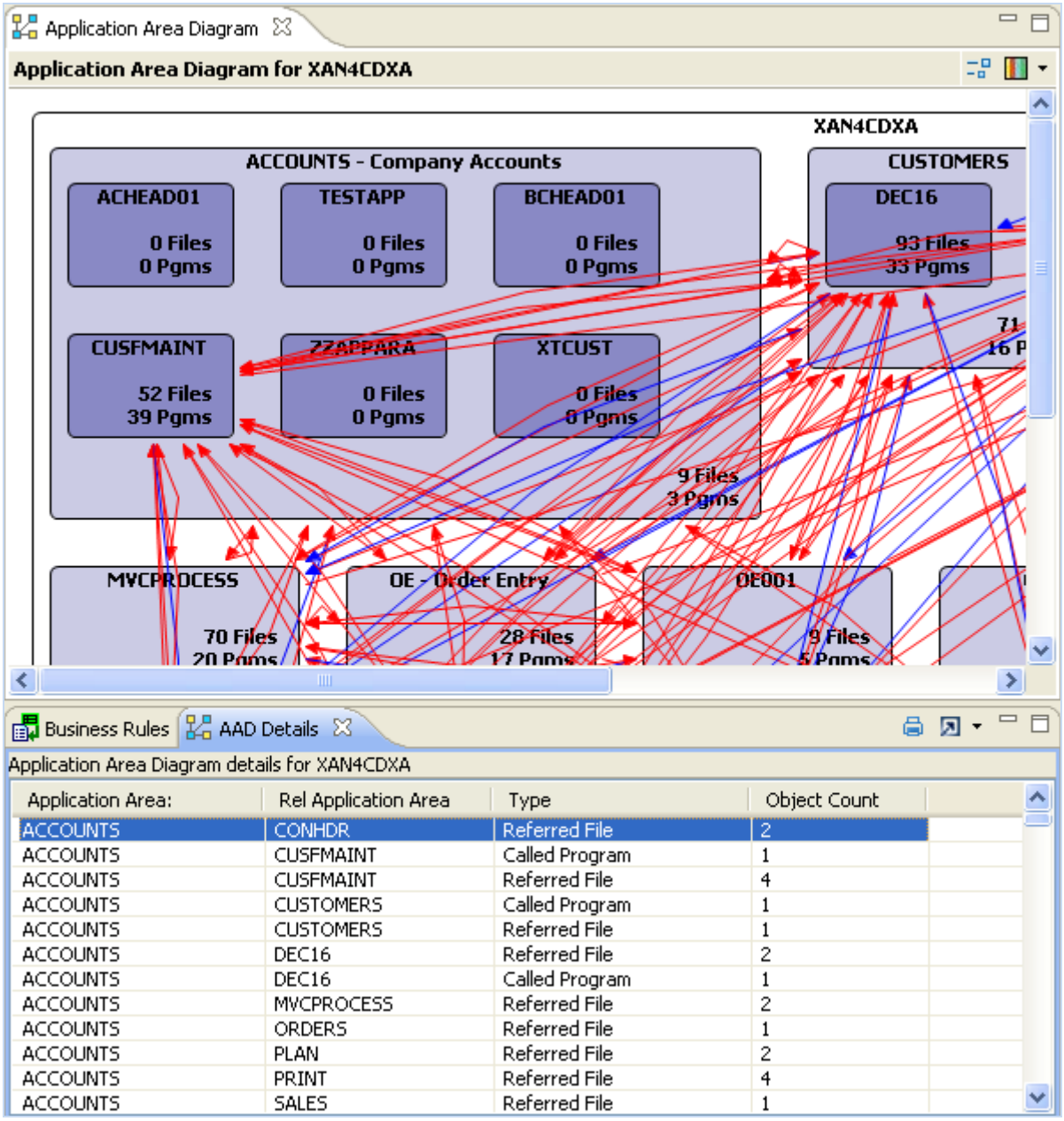
Application Area Diagram details for XAN4CDXA



Application Area:	Rel Application Area	Type	Object Count
ACCOUNTS	CONHDR	Referred File	2
ACCOUNTS	CUSFMAINT	Called Program	1
ACCOUNTS	CUSFMAINT	Referred File	4
ACCOUNTS	CUSTOMERS	Called Program	1
ACCOUNTS	CUSTOMERS	Referred File	1
ACCOUNTS	DEC16	Referred File	2
ACCOUNTS	DEC16	Called Program	1
ACCOUNTS	MVCPROCESS	Referred File	2
ACCOUNTS	ORDERS	Referred File	1
ACCOUNTS	PLAN	Referred File	2
ACCOUNTS	PRINT	Referred File	4
ACCOUNTS	SALES	Referred File	1

Area Flow Diagram

Another important diagrammatic construct is the 'Area Flow Diagram'. As the name suggests, this option is available for application areas only. It displays programs and files available in an application area along with their relations.

Select **Area Flow Diagram** option from the context menu of the application area - MVCPROCESS.

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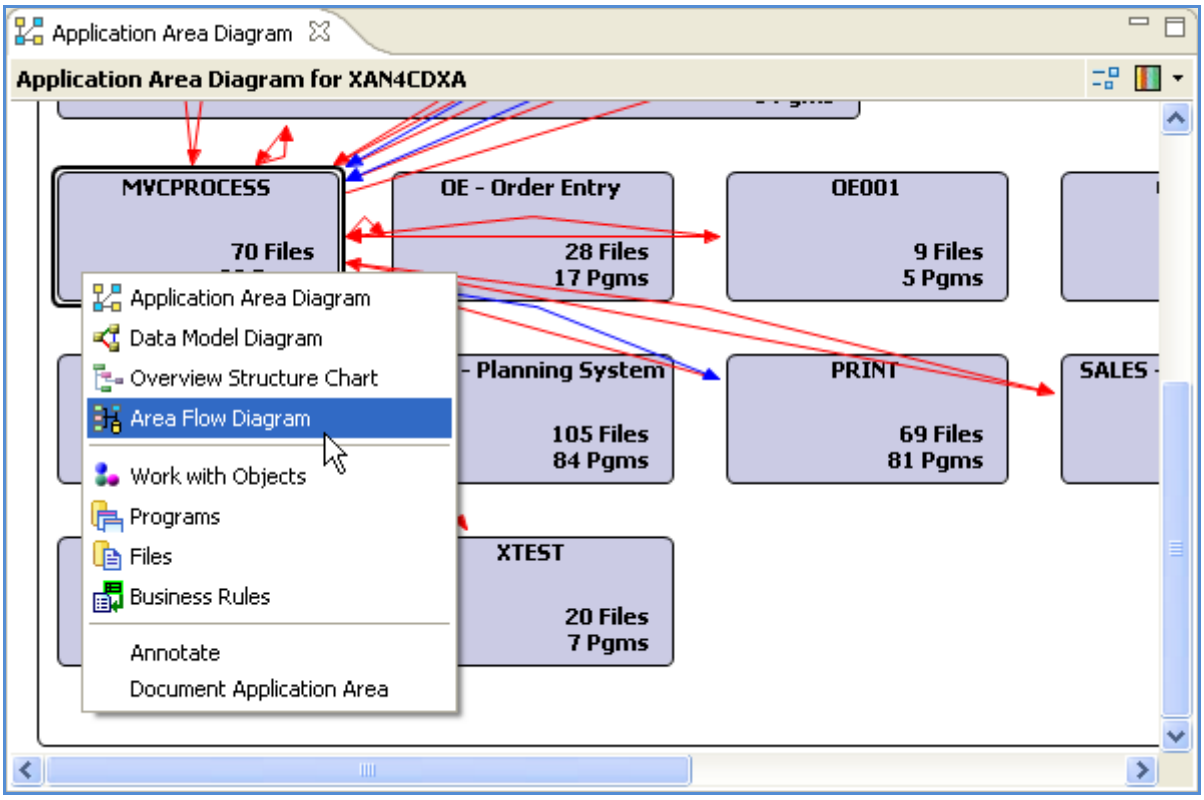
Area Flow Diagram option



This invokes ‘Area Flow Diagram’ for the application area - MVCPROCESS.

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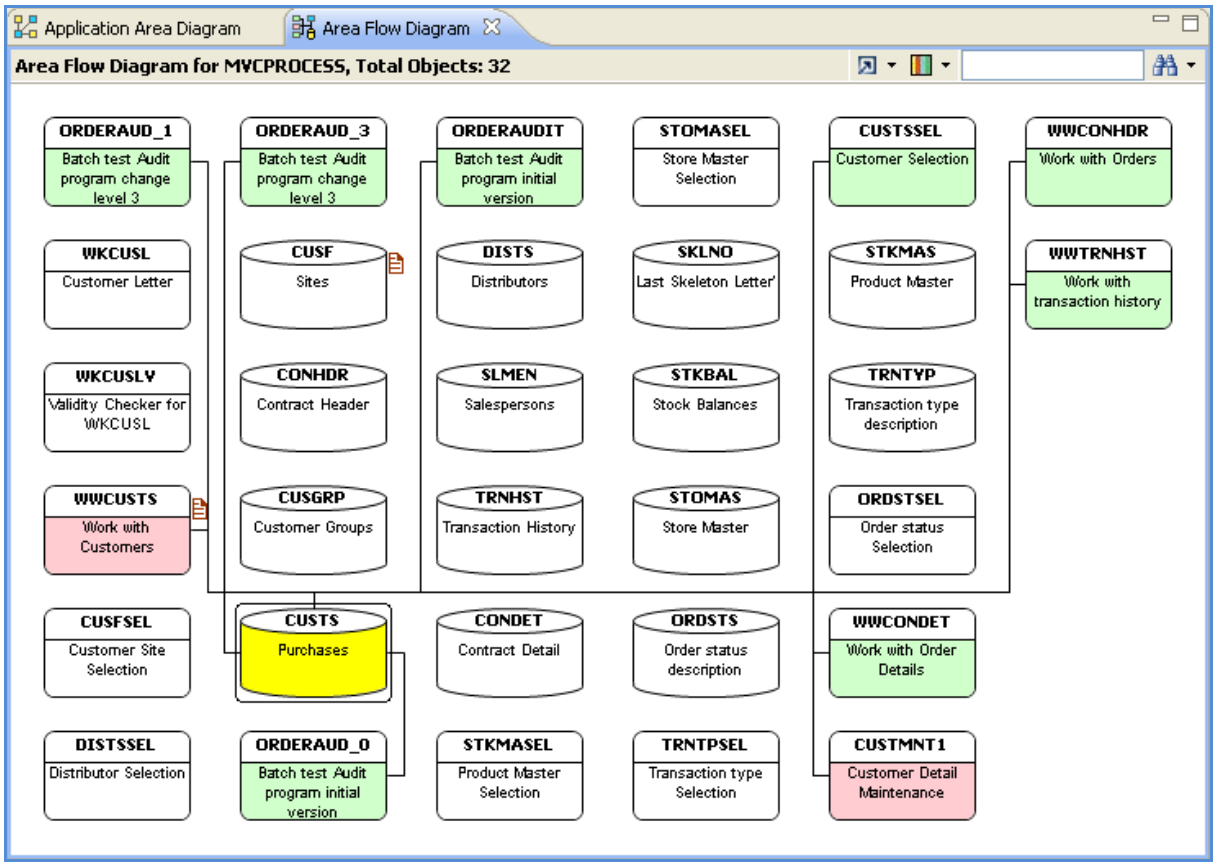
Area Flow Diagram for application area MVCPROCESS



The default selection is on the file with the greatest number of programs referring it.

Data Model Diagram - Application Area Specific

The Data Model Diagram for an application area represents relationships among the related objects that belong to that application area only. Select **Data Model Diagram** option, for the application area - MVCPROCESS.

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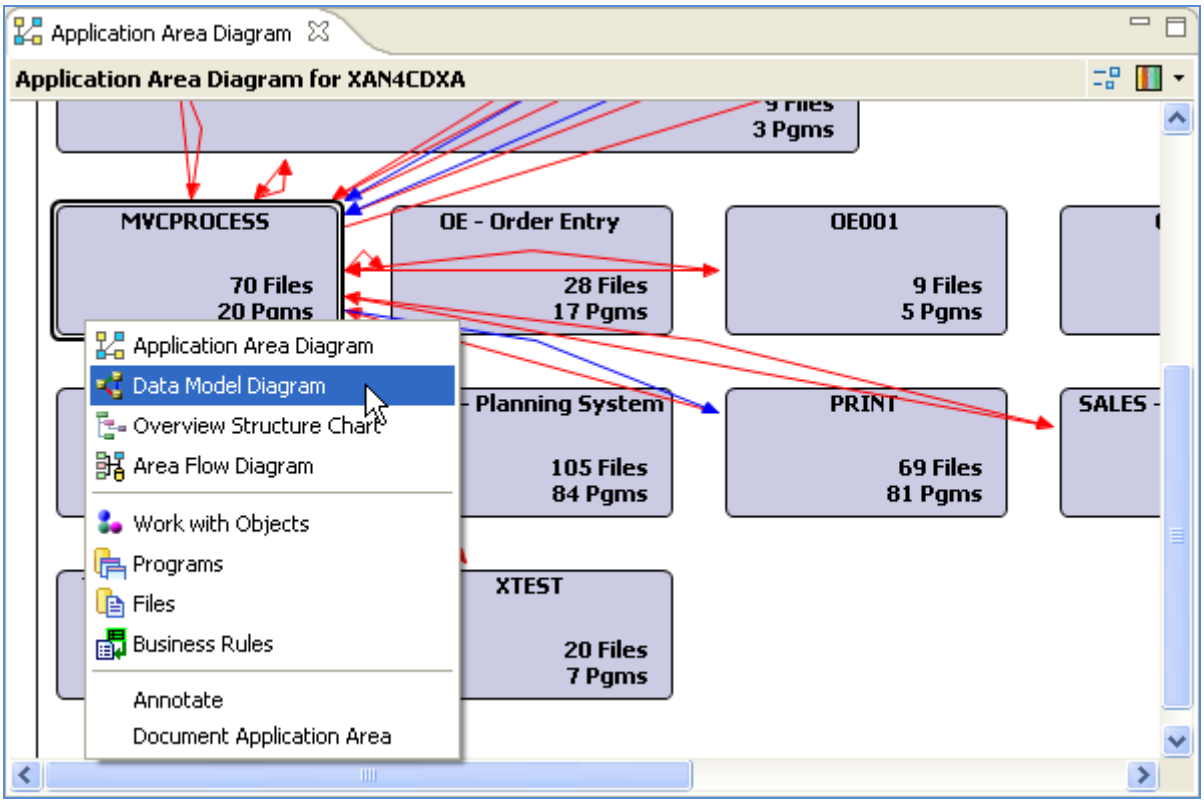
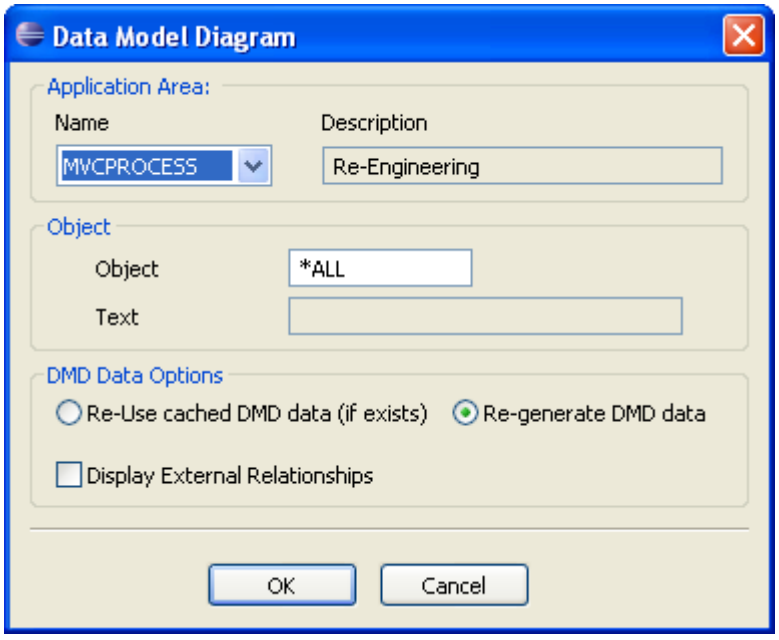
Data Model Diagram option from the Application Area Diagram



This invokes the Data Model Diagram dialog for the application area – MVCPROCESS.

Data Model Diagram dialog



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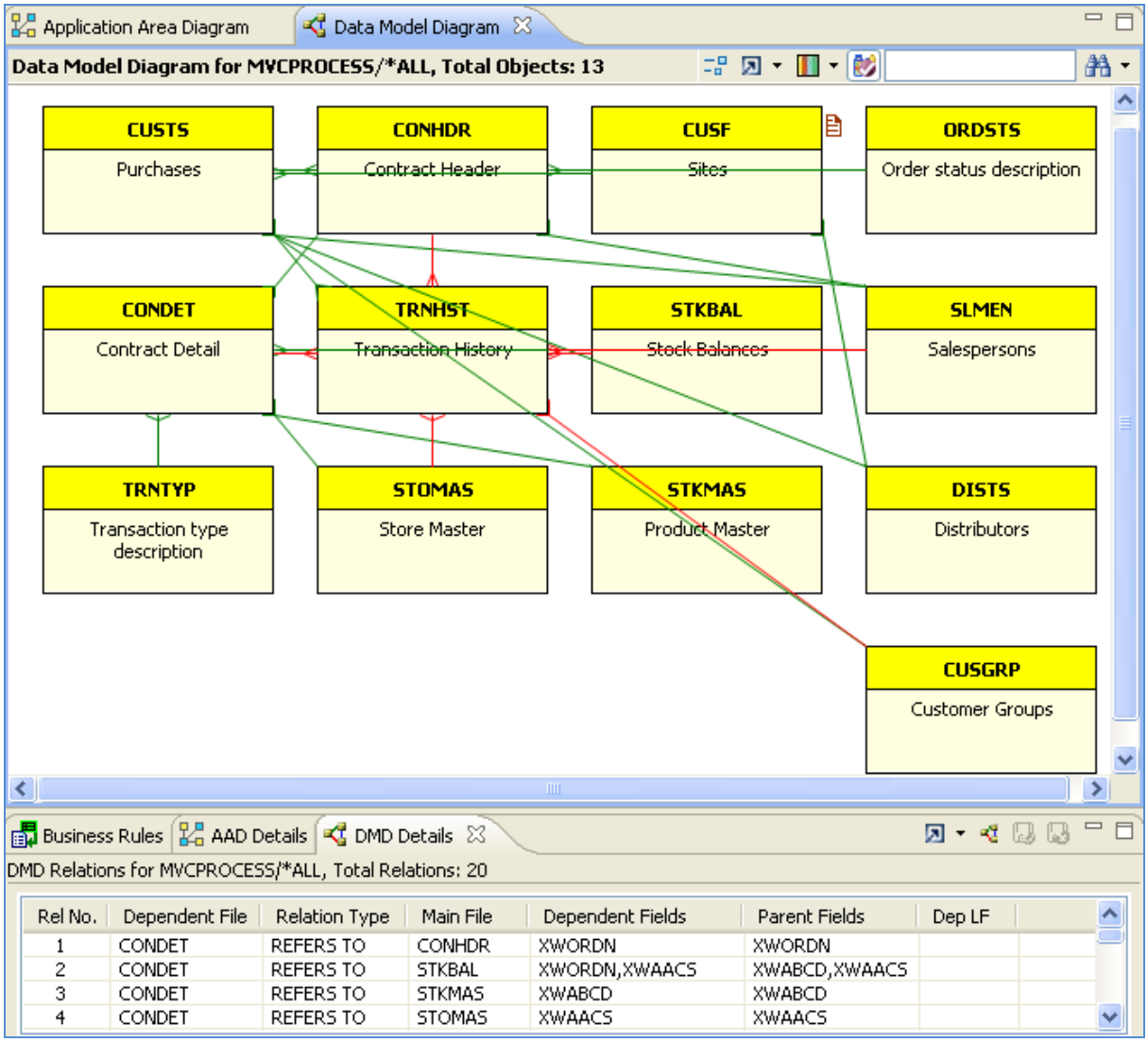
Click the **OK** button to generate the Data Model Diagram for the selected application area.

Data Model Diagram for an application area (Restricted)



Rel No.	Dependent File	Relation Type	Main File	Dependent Fields	Parent Fields	Dep LF
1	CONDET	REFERS TO	CONHDR	XWORDN	XWORDN	
2	CONDET	REFERS TO	STKBAL	XWORDN,XWAACS	XWABCD,XWAACS	
3	CONDET	REFERS TO	STKMAS	XWABCD	XWABCD	
4	CONDET	REFERS TO	STOMAS	XWAACS	XWAACS	

The Data Model Diagram displayed above is a restricted Data Model and it only displays the objects which belong to the application area ‘MVCPROCESS’.

The toolbar on the Data Model Diagram has an option to generate the Un-restricted Data Model Diagram. Click the **Un-restrict to Application Area** icon.

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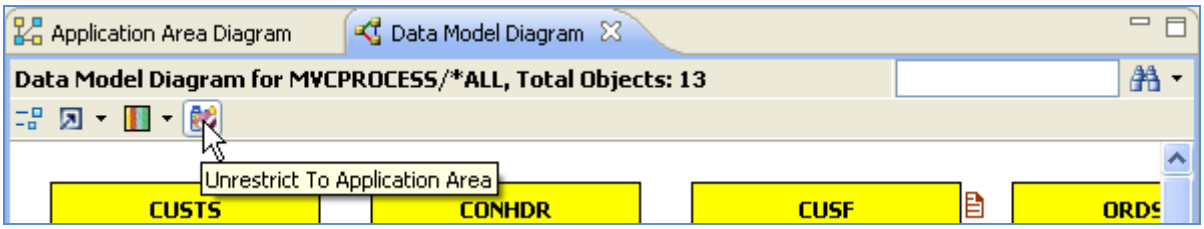
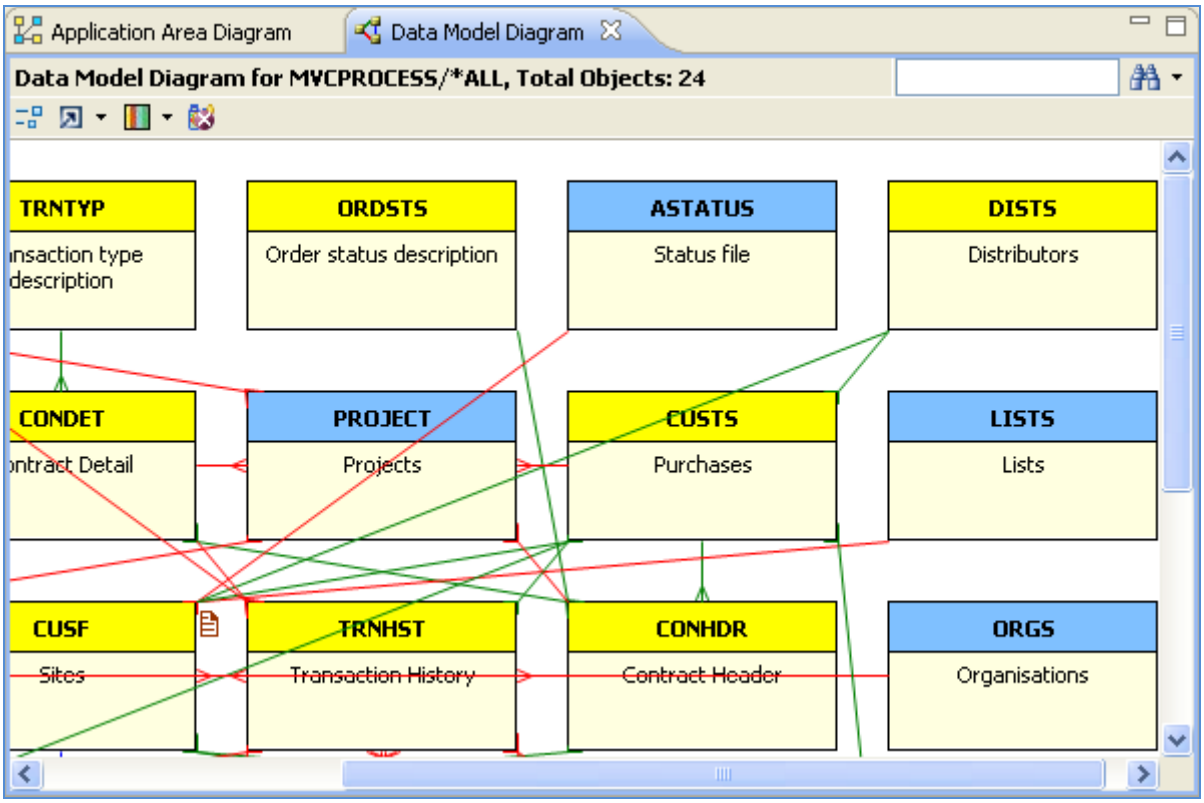
Unrestricted to Application Area icon



Data Model Diagram for Application Area (Unrestricted)



Note the objects displayed in blue colour. These are the ones which do not belong to the application area MVCPROCESS.

Data Flow Diagram - Application Area Specific

The Data Flow Diagram for an application area displays objects that belong only to that application area. From the Data Model Diagram displayed above, right click on the object CUSTS and opt **Data Flow Diagram** option.

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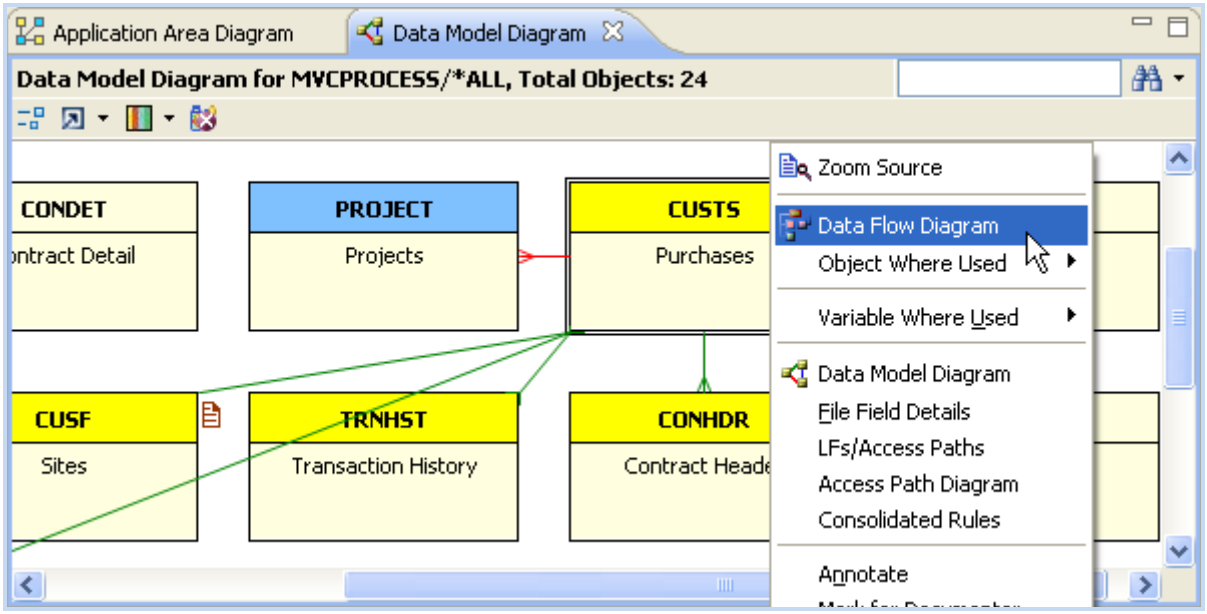
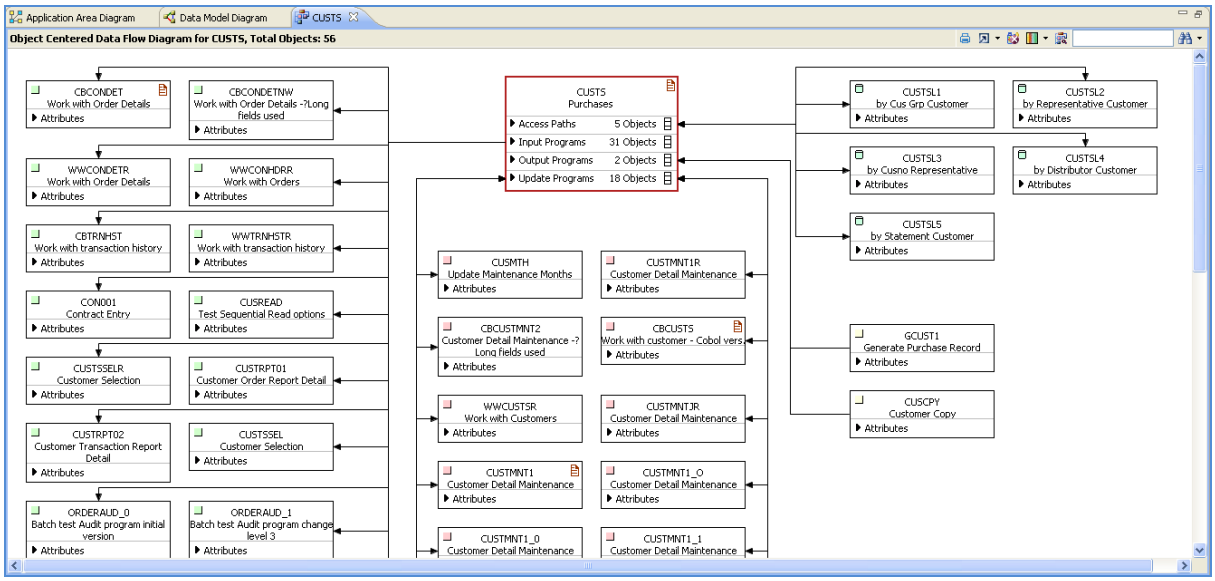
Data Flow Diagram option from Data Model Diagram



This generates the 'Data Flow Diagram' for the object CUSTS.

Data Flow Diagram for CUSTS



The objects displayed with a blue corner are the ones which do not belong to the application area MVCPROCESS, and are referred to as 'External' objects.

Business Rules

An application is chiefly characterized through the logic embedded in its source codes and process models. This logic is also collectively referred to as Business Rules. Legacy RPG and COBOL

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programs suffer from a drawback, in which the business rules (logic) get mixed with screen handling, database I/O, and flow control. Most organizations shy away from the challenge of retrieving these business rules, as it is a time-consuming, highly specialized, expensive, and labour-intensive exercise.

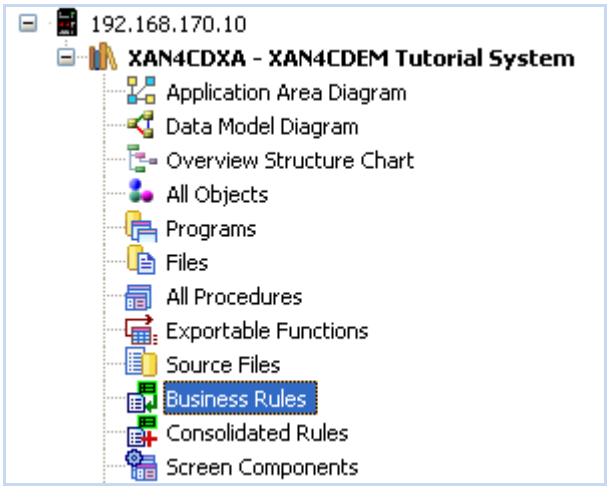
The task of decoding and configuring the legacy code becomes easier and more cost-effective by using X-Analysis. First, it automatically runs the scan on RPG & COBOL programs and 2E model. Secondly, it separates the rule code from the body of the application, like the proverbial “separating grain from the chaff”. It stores the business rule code into a neatly structured, usable repository. Finally, it provides precise text narratives describing these retrieved rules. The user can check out the derived business rules using the Business Rules view.

Building a repository of business rules serves well in the long run. It not only expedites the future reengineering/rewrite projects or package replacement projects, but also facilitates ongoing legacy maintenance operations.

The ‘Derive Business Rules’ option on a program (or application), recovers the business rules. In the tutorial application, there are some previously derived Business rules.

Double click on **Business Rules** node under the tutorial application.

Business Rules node under Tutorial Application



This invokes the business rules window, displaying business rules for the tutorial application.

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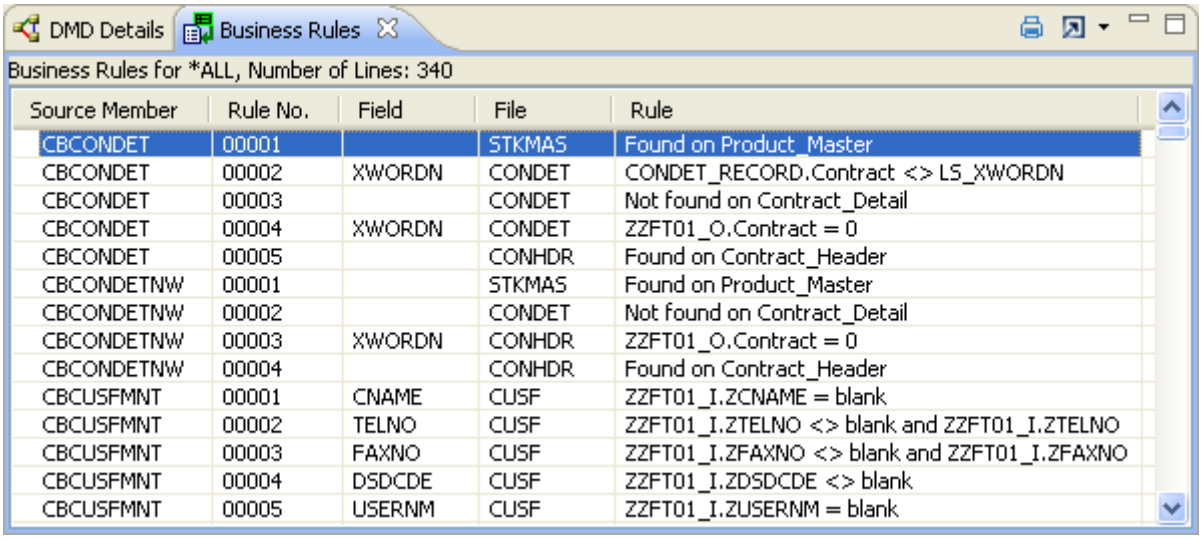
Business Rules Window



Source Member	Rule No.	Field	File	Rule
CBCONDET	00001		STKMAS	Found on Product_Master
CBCONDET	00002	XWORDN	CONDET	CONDET_RECORD.Contract <> LS_XWORDN
CBCONDET	00003		CONDET	Not found on Contract_Detail
CBCONDET	00004	XWORDN	CONDET	ZZFT01_O.Contract = 0
CBCONDET	00005		CONHDR	Found on Contract_Header
CBCONDETNW	00001		STKMAS	Found on Product_Master
CBCONDETNW	00002		CONDET	Not found on Contract_Detail
CBCONDETNW	00003	XWORDN	CONHDR	ZZFT01_O.Contract = 0
CBCONDETNW	00004		CONHDR	Found on Contract_Header
CBCUSFMNT	00001	CNAME	CUSF	ZZFT01_I.ZCNAME = blank
CBCUSFMNT	00002	TELNO	CUSF	ZZFT01_I.ZTELNO <> blank and ZZFT01_I.ZTELNO
CBCUSFMNT	00003	FAXNO	CUSF	ZZFT01_I.ZFAXNO <> blank and ZZFT01_I.ZFAXNO
CBCUSFMNT	00004	DSDCDE	CUSF	ZZFT01_I.ZDSDCDE <> blank
CBCUSFMNT	00005	USERNM	CUSF	ZZFT01_I.ZUSERNM = blank

Scroll down to the object CUSTMNT1 and double click on Rule No. 00002. This zooms into business rules of the program CUSTMNT1 with the cursor positioned on the selected business rule.

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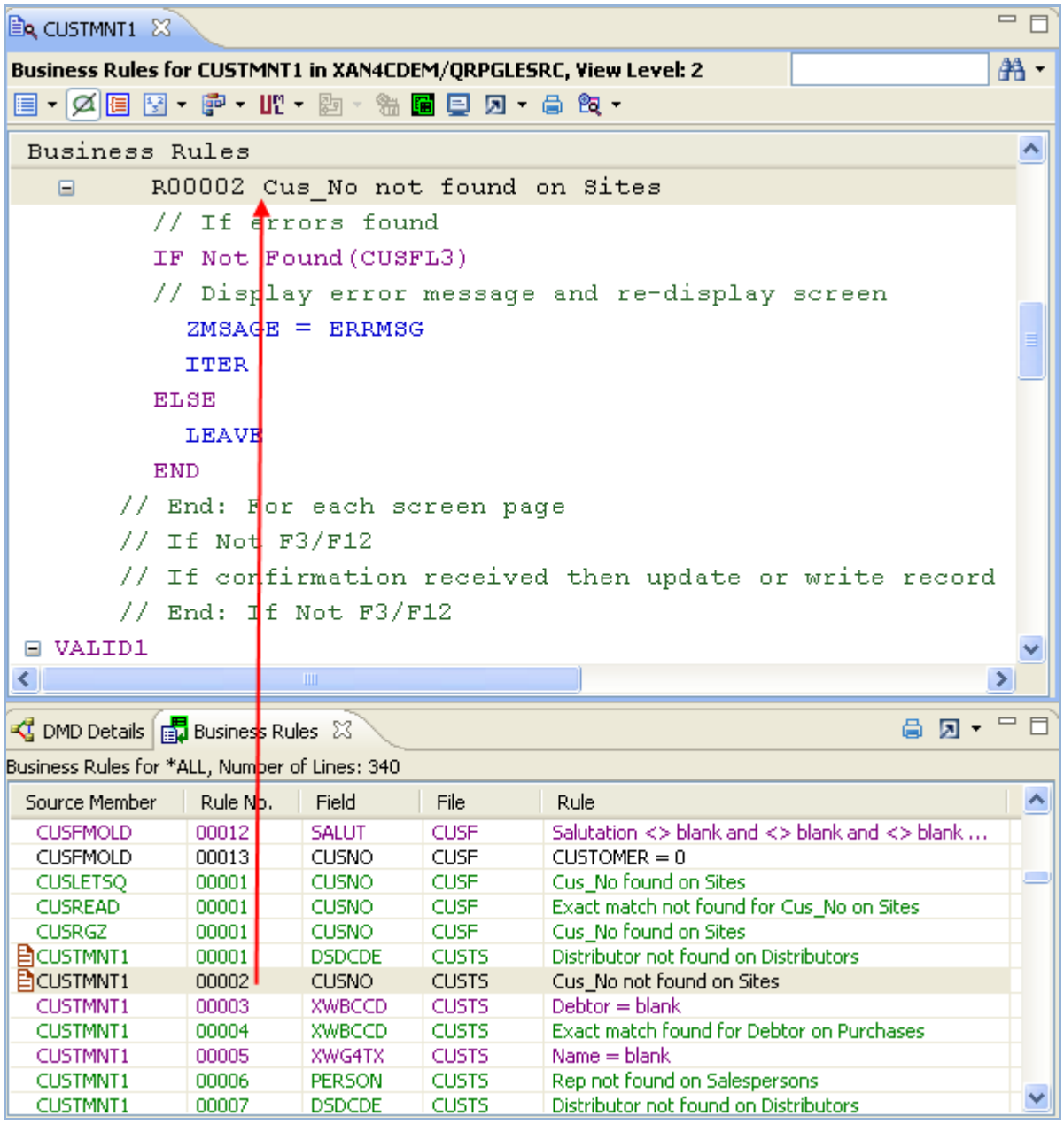
Business Rules for program CUSTMNT1


CUSTMNT1
Business Rules for CUSTMNT1 in XAN4CDEM/QRPGLESRC, View Level: 2
Business Rules
R00002 Cus_No not found on Sites
// If errors found
IF Not Found(CUSFL3)
// Display error message and re-display screen
ZMSAGE = ERRMSG
ITER
ELSE
LEAVE
END
// End: For each screen page
// If Not F3/F12
// If confirmation received then update or write record
// End: If Not F3/F12
VALID1
DMD Details
Business Rules
Business Rules for *ALL, Number of Lines: 340
Source Member | Rule No. | Field | File | Rule
CUSFMOLD | 00012 | SALUT | CUSF | Salutation <> blank and <> blank and <> blank ...
CUSFMOLD | 00013 | CUSNO | CUSF | CUSTOMER = 0
CUSLETSQ | 00001 | CUSNO | CUSF | Cus_No found on Sites
CUSREAD | 00001 | CUSNO | CUSF | Exact match not found for Cus_No on Sites
CUSRGZ | 00001 | CUSNO | CUSF | Cus_No found on Sites
CUSTMNT1 | 00001 | DSDCDE | CUSTS | Distributor not found on Distributors
CUSTMNT1 | 00002 | CUSNO | CUSTS | Cus_No not found on Sites
CUSTMNT1 | 00003 | XWBCCD | CUSTS | Debtor = blank
CUSTMNT1 | 00004 | XWBCCD | CUSTS | Exact match found for Debtor on Purchases
CUSTMNT1 | 00005 | XWG4TX | CUSTS | Name = blank
CUSTMNT1 | 00006 | PERSON | CUSTS | Rep not found on Salespersons
CUSTMNT1 | 00007 | DSDCDE | CUSTS | Distributor not found on Distributors

Consolidated Rules

X-Analysis provides an important feature related to file-fields and their business rules. A user can view all the business rules related to a file-field combination. Select **Consolidated Rules** node, available under the cross-reference library.

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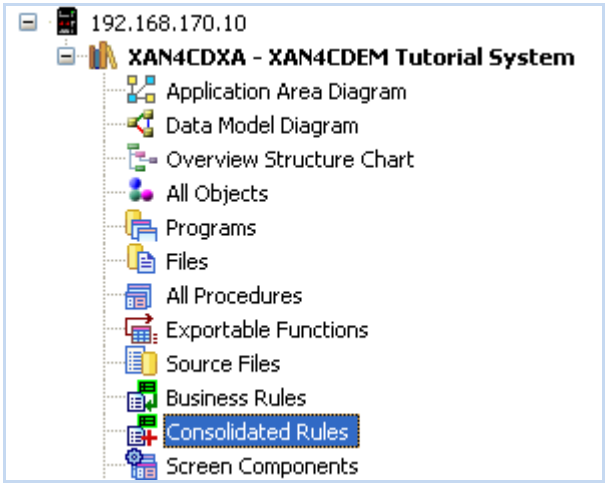
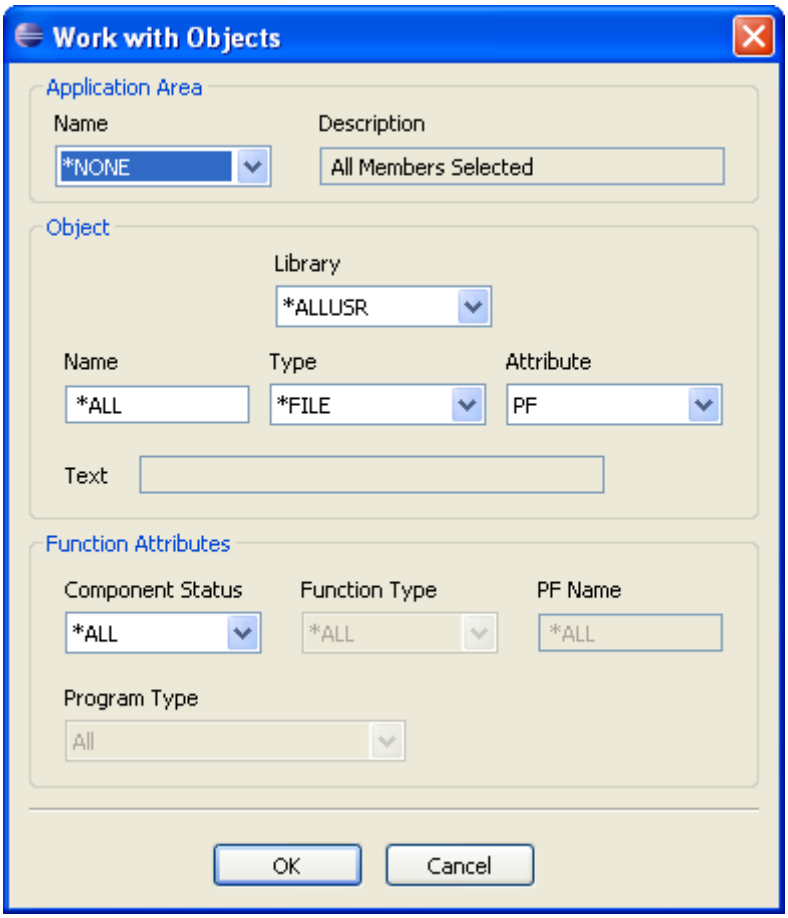
Consolidated Rules Node under the Cross-Reference Library



Double click on **Consolidated Rules** to invoke the 'Work with Objects' dialog.

Work with Objects dialog to display Consolidated Rules



Click the **OK** button to invoke a new window displaying the 'Consolidated Rules'.

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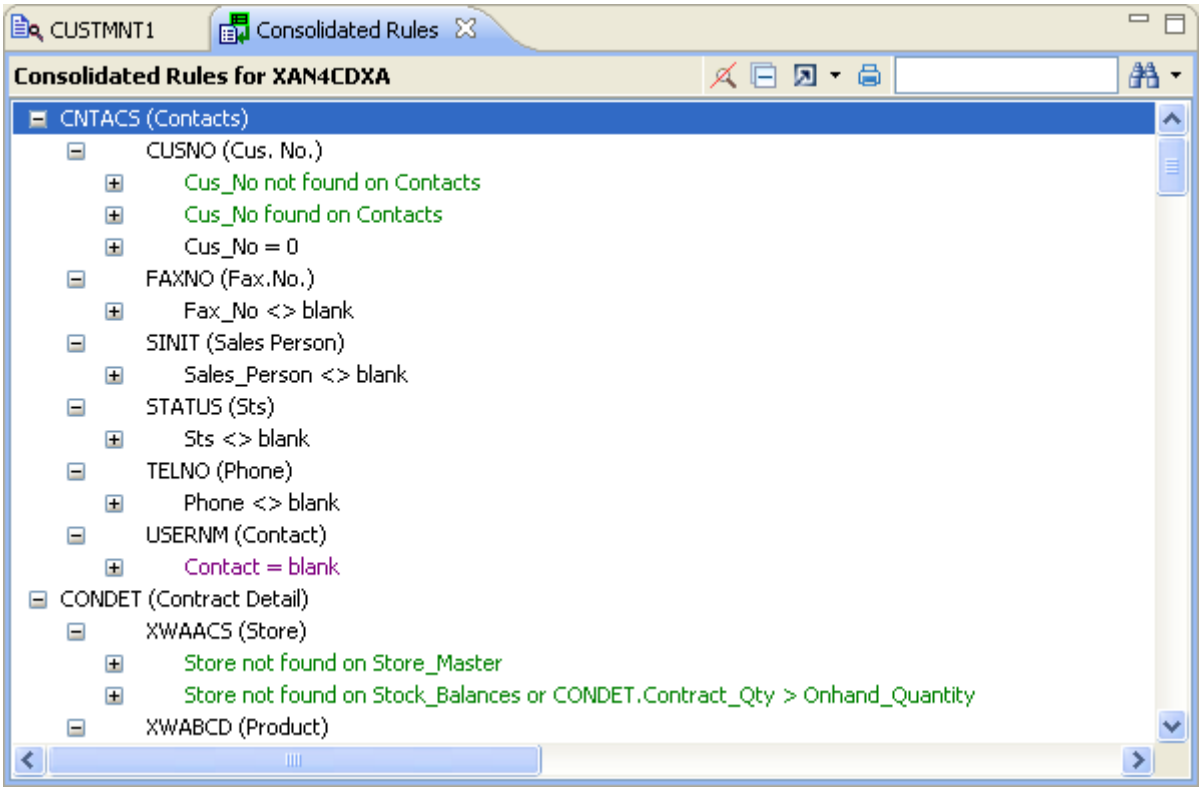
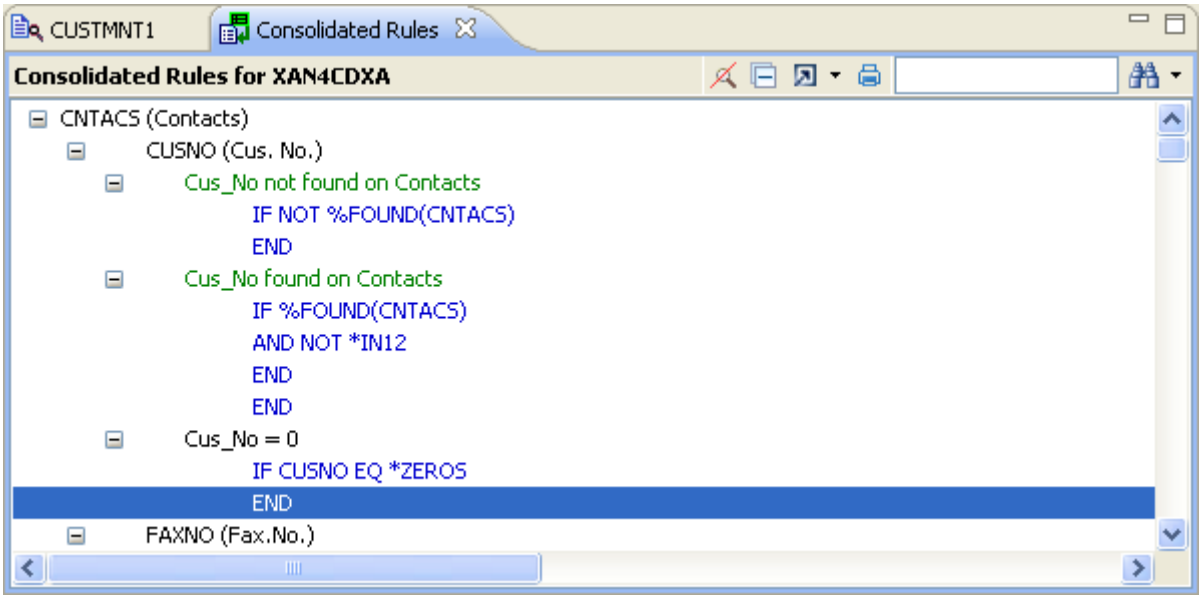
Consolidated Rules for XAN4CDXA



Select a business rule listed under a file and expand the business rule node to see the actual business rule code.

Expand Business Rules node to see the actual code



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Chapter 6: Metrics Analysis

The chapter presents another powerful option designed to meet the advanced computing requirements of today – Metrics Analysis.

The chapter contains:

- Metrics Analysis
- Metrics History: Tells you how to track all the generated data at different levels of complexity.
- Screen Metrics: Provides you with the multi-level classification of all the screen functions.
- File Metrics: This segment briefs you on how to access various metrics information.
- Business Process Logic Metrics: Displays migrated logic data in metrics format.
- Specialised Analysis: This feature lets the user to customize reports.
- Problem Analysis: Select this feature to know about any existent discrepancies in the data.
- Object Allocation: Displays objects allocation with their respective application areas.
- Summary Report: Use this option to generate structured reports.
- Generate Metrics Analysis: Option to generate Metrics data.
- Generate Problem Analysis: Option to generate Problem Analysis data.

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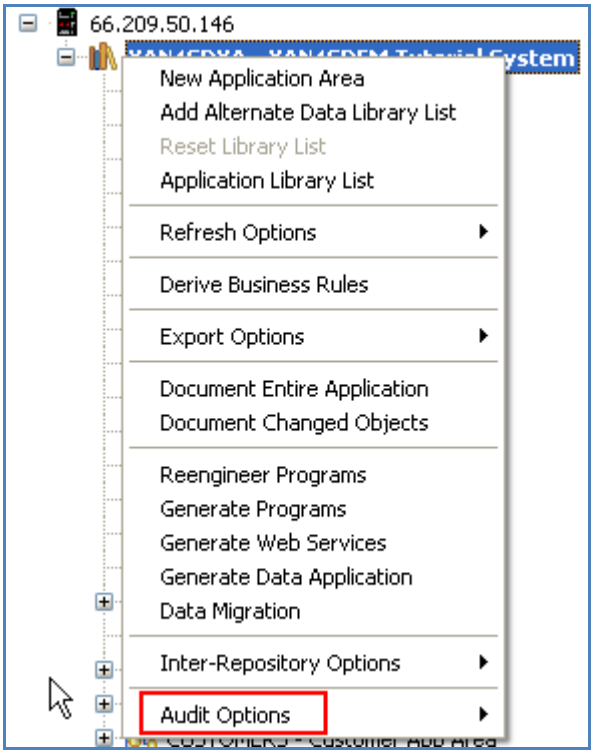
The Metrics Analysis solution set comprises the X-Audit module. The X-Audit module provides quality and complexity metrics for development and analytical purposes. X-Analysis client provides options related to the X-Audit module called 'Audit Options'.

Audit Options in X-Analysis



Audit Options

The 'Audit Options' sub-menu is available on the context menu of application library and application areas. The following menu options are available under 'Audit Options':

- Metrics Analysis
- Screen Metrics
- File Metrics
- Business Process Logic Metrics
- Specialized Analysis
- Problem Analysis
- Object Allocation
- Summary Report
- Generate Metrics Analysis
- Generate Problem Analysis

Metrics Analysis

"As a system evolves, its complexity increases, unless steps are taken to reduce it"- Professor Meir Lehman

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X-Analysis provides advanced computing solutions in the form of Metrics Analysis because it recognizes the importance of monitoring, measuring, and managing the complexity and changes to databases of legacy applications.

Metrics Analysis simplifies the procedure by classifying each program based on low, average, and high complexity. It uses mathematical formulae to ascertain the complexity level. The user has to assign weights in the range of 1- 6 as per each file usage per program. If the sum total of weights is:

>20 – it indicates High complexity

10-20 – it indicates Average complexity

<10 – it indicates Low complexity

Under the Metrics Analysis, we have other parameters as well like Halstead, Maintainability Index etc.

Halstead is calculated using four different values (N1, N2, n1 and n2) obtained from the source code of each subroutine. These values show numbers of different op codes or number of different variables used in the sub routines, whether once or multiple times. Measurements are calculated thus:

Module length = N1 + N2

Module vocabulary = n1 + n2

Halstead Volume = N *log(2)n

Difficulty = (n1/2) * (N2/n2)

Effort = Volume * Difficulty

Maintainability Index – Hewlett-Packard engineers propound this formula. According to this, a number derived is directly proportional to the maintainability factor. This means the lower the number, the less maintainable the code will be and vice versa. This calculation is also performed at the subroutine level. It uses four numbers as input:

HV – Halstead volume from above

CC – Cyclomatic Complexity from above

LOC – Lines of actual code in the subroutine

COM – Lines of non-blank comments in the subroutine (beginning after the previous ENDSR)

MI = 5.2*naturallog (HV) – 0.23*CC – 16.2naturallog (LOC) + 50.0*sin (square root (2.46*COM))

Some more specific details with accompanying screenshots are available in the following pages.

The ‘Metrics Analysis’ option provides low, medium, and high complexity classification of each program, based on the following attributes of a program:

- Source Type
- Source Lines
- Cyclomatic Complexity
- Halstead
- Maintainability Index

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- Files
- Device files comprising Display Files and Printer Files
- Called Programs
- Calling Programs

The Metrics information is broken down at highest level into the following categories:

- Batch programs
- Interactive programs

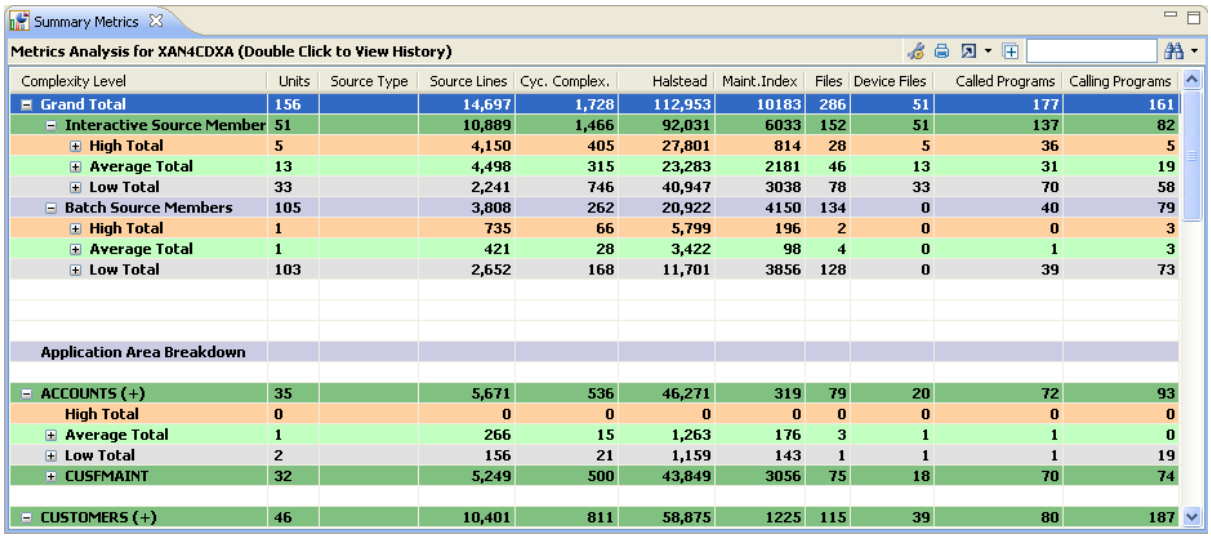
These two highest levels are then further sub-categorised as High, Average, and Low.

The user specified values determine where a program fits into these sub-categories. By default, these preferences are blank, so every program is 'Low' complexity until values have been set. Check the Metrics Preferences section (below) to set these values.

Note: Please execute 'Generate Metrics Analysis' option before opting Metrics Analysis option.

The following screen displays the Metrics information for the cross-reference library XAN4CDXA.

Metrics Analysis for XAN4CDXA



Complexity Level	Units	Source Type	Source Lines	Cyc. Complex.	Halstead	Maint.Index	Files	Device Files	Called Programs	Calling Programs
Grand Total	156		14,697	1,728	112,953	10183	286	51	177	161
Interactive Source Member	51		10,889	1,466	92,031	6033	152	51	137	82
High Total	5		4,150	405	27,801	814	28	5	36	5
Average Total	13		4,498	315	23,283	2181	46	13	31	19
Low Total	33		2,241	746	40,947	3038	78	33	70	58
Batch Source Members	105		3,808	262	20,922	4150	134	0	40	79
High Total	1		735	66	5,799	196	2	0	0	3
Average Total	1		421	28	3,422	98	4	0	1	3
Low Total	103		2,652	168	11,701	3856	128	0	39	73
Application Area Breakdown										
ACCOUNTS (+)	35		5,671	536	46,271	319	79	20	72	93
High Total	0		0	0	0	0	0	0	0	0
Average Total	1		266	15	1,263	176	3	1	1	0
Low Total	2		156	21	1,159	143	1	1	1	19
CUSFMAINT	32		5,249	500	43,849	3056	75	18	70	74
CUSTOMERS (+)	46		10,401	811	58,875	1225	115	39	80	187

The Metrics information displayed above has the following columns:

1. **Complexity Level:** For each attribute, e.g. each file usage = 1, etc. The sum total of these per program will be calculated and the Complexity level for the program worked out, e.g. Points <10 - LOW, 10-20 - AVERAGE, >20 - HIGH. If desired a user can allocate values for each complexity classification using the Metrics Preferences option.
2. **Units:** When collapsed it displays total number of programs. When expanded it displays name of program.
3. **Source Type:** Informs about the type of source.
4. **Source Lines:** It is total number of Source Lines in a source member.

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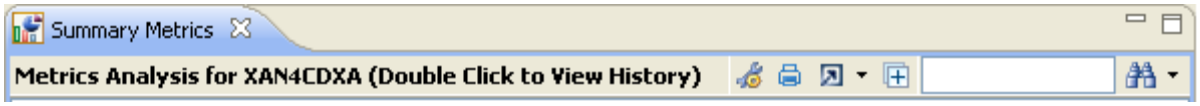
5. **Cyclomatic Complexity:** Measures amount of decision logic in a program. Shows total number of conditional statements used.
6. **Halstead:** Displays program's complexity directly from source code based upon the operators and operands used.
7. **Maintainability Index:** The maintainability index calculated with certain formulae from lines-of-code measures, Cyclomatic Complexity and Halstead complexity measures.
8. **Files:** It is total number of Files used by a source member.
9. **Device Files:** Total number of Display and Printer Files used by source member.
10. **Called Programs:** It display total number of called programs from a source member.
11. **Calling Programs:** It display total number of calling programs from a source member.

Metrics Toolbar

The metrics toolbar comprises of various options.

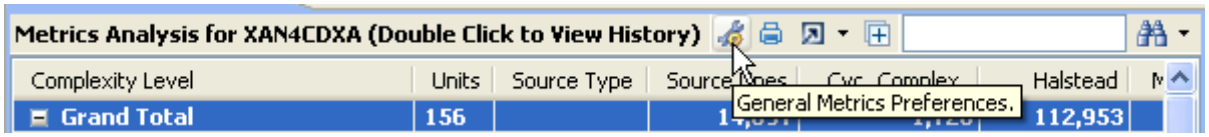
Toolbar available on Metrics Window



Metrics Preferences

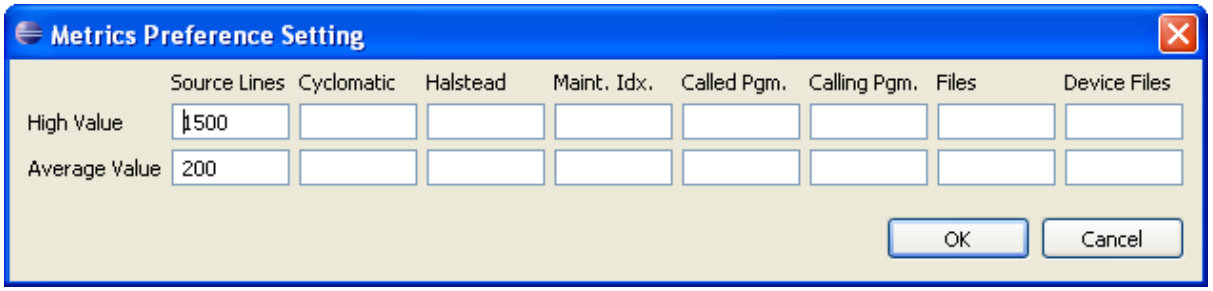
A user can set the Metrics Preferences as per requirements.

General Metrics Preferences Icon on Metrics Window Toolbar



Click the **General Metrics Preference** icon to invoke the preferences dialog:

General Metrics Preferences Dialog



Specify a high value, so that any value above this will determine that program is of higher complexity. Any program that falls below an average setting will be determined as fewer complexes.

Print Metrics

To print the Metrics information, click the **Print** button.

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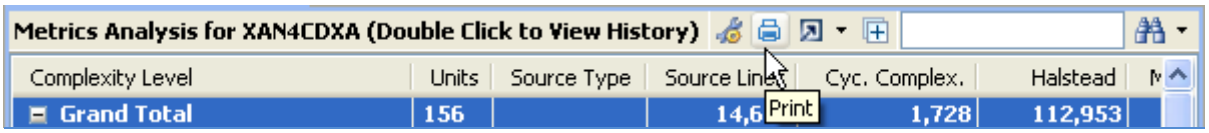
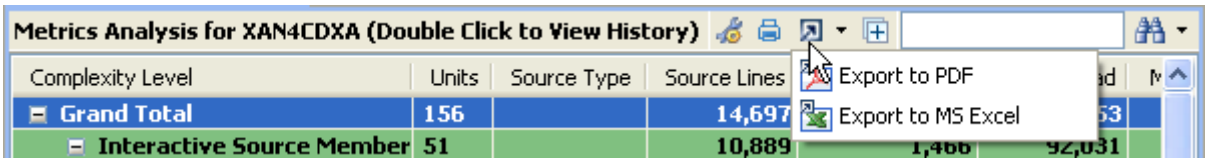
Print Icon on Metrics Window Toolbar



Export Metrics

Select PDF or MS Excel option as required, from the **Export** icon.

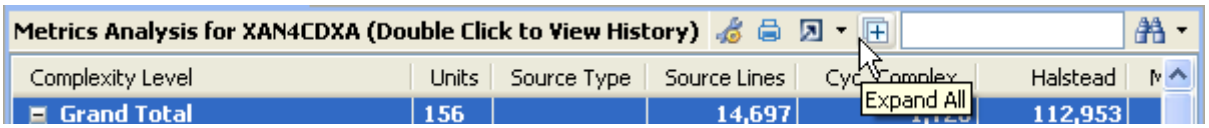
Export Options on Metrics Window Toolbar



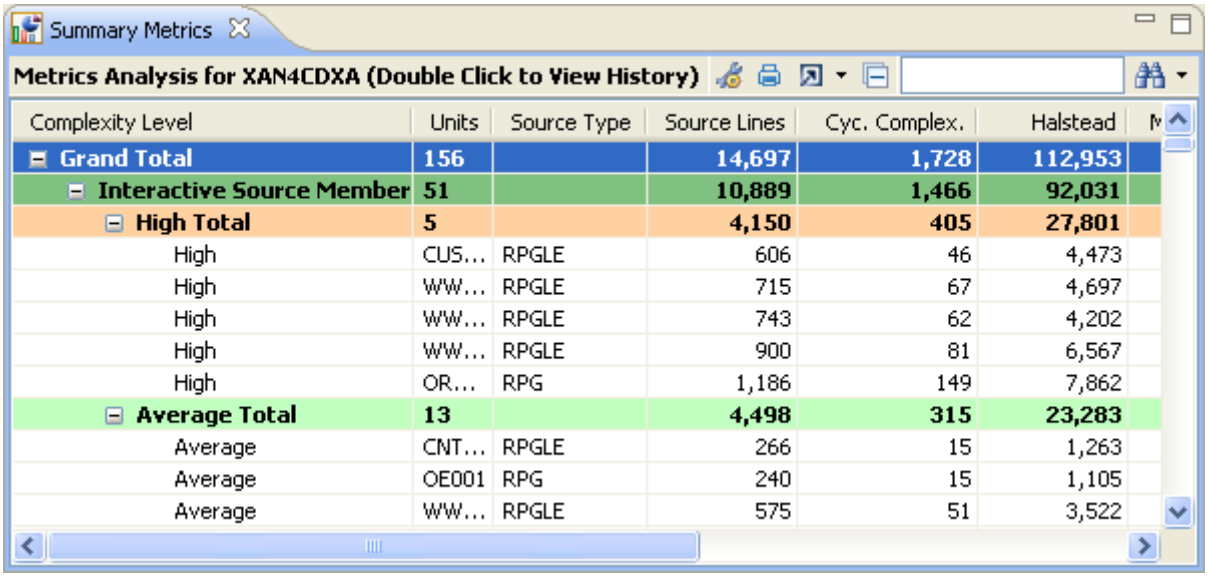
Expand All

Click the **Expand All** icon to expand all the data:

Expand All - option on Metrics Analysis Toolbar



Expanded Metrics Window



Metrics History

The Metrics History displays all previous instances of the generated metrics data. The metrics history data will be available only when the metrics data generated more than once.

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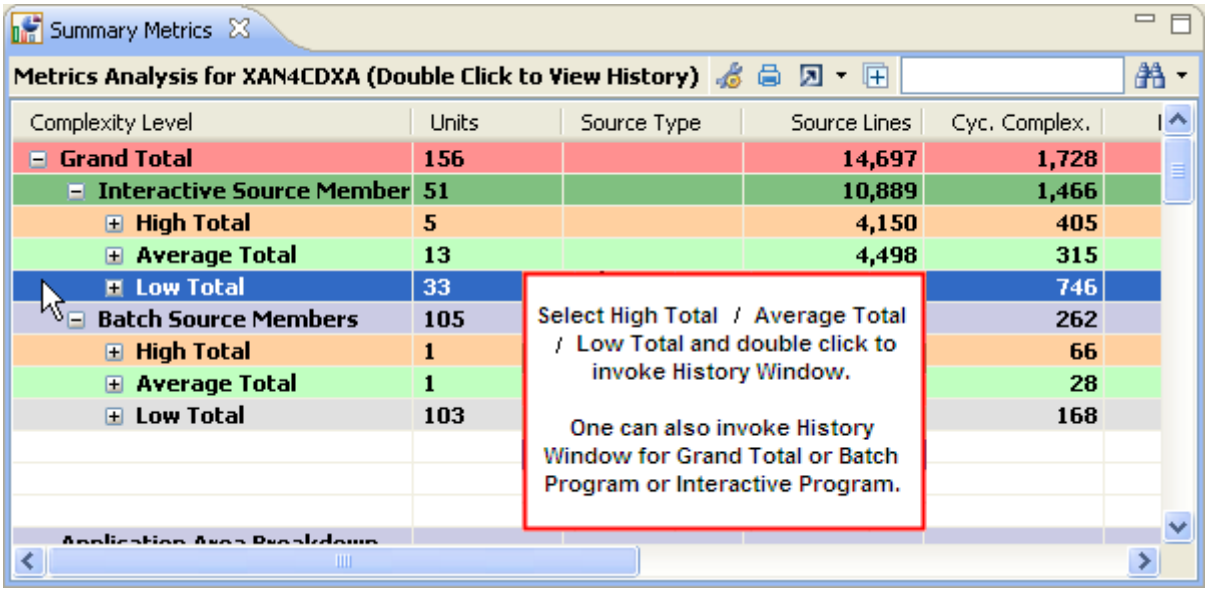
The Metrics History can be generated for all the individual levels – High, Average & Low Totals for Batch / Interactive Programs and for the Grand Total.

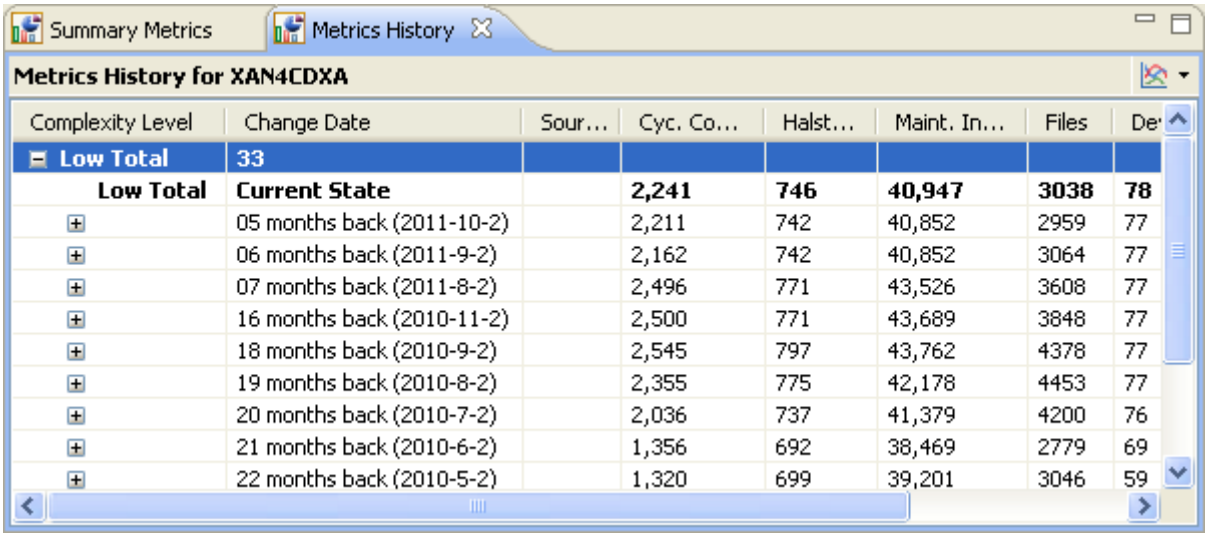
Double click on the **Interactive Source Members** row to generate the history.

Invoking Metrics History for Interactive Programs


Summary Metrics
Metrics Analysis for XAN4CDXA (Double Click to View History)
Complexity Level
Units
Source Type
Source Lines
Cyc. Complex.
Grand Total 156 14,697 1,728
Interactive Source Member 51 10,889 1,466
High Total 5 4,150 405
Average Total 13 4,498 315
Low Total 33 746
Batch Source Members 105 262
High Total 1 66
Average Total 1 28
Low Total 103 168
Select High Total / Average Total / Low Total and double click to invoke History Window.
One can also invoke History Window for Grand Total or Batch Program or Interactive Program.

Double click **Low Total** row on the Metrics Window to invoke Metrics History window.

Metrics History Window for Interactive Programs



Metrics History Chart

X-Analysis can also display Metrics History as a chart form for all the individual parameters. The Metrics History toolbar contains a drop down button called 'Metrics Analysis'.

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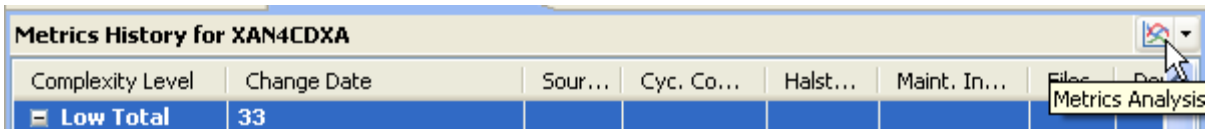
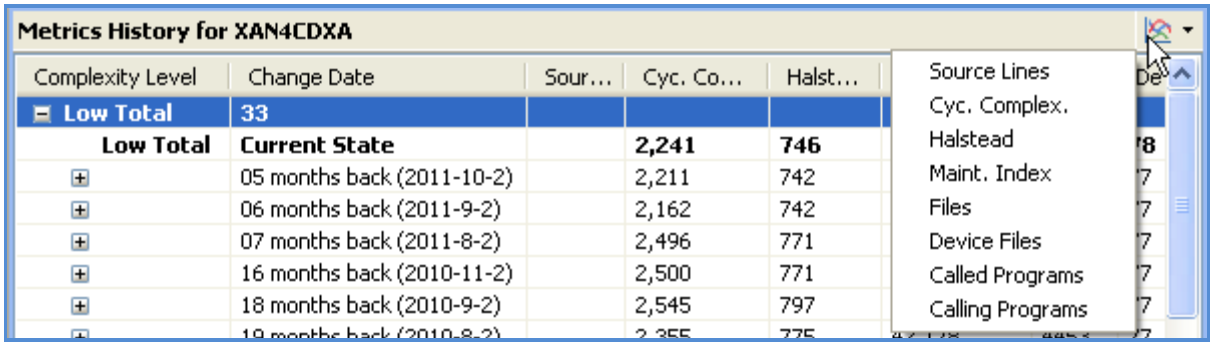
Metrics Analysis Drop Down Button



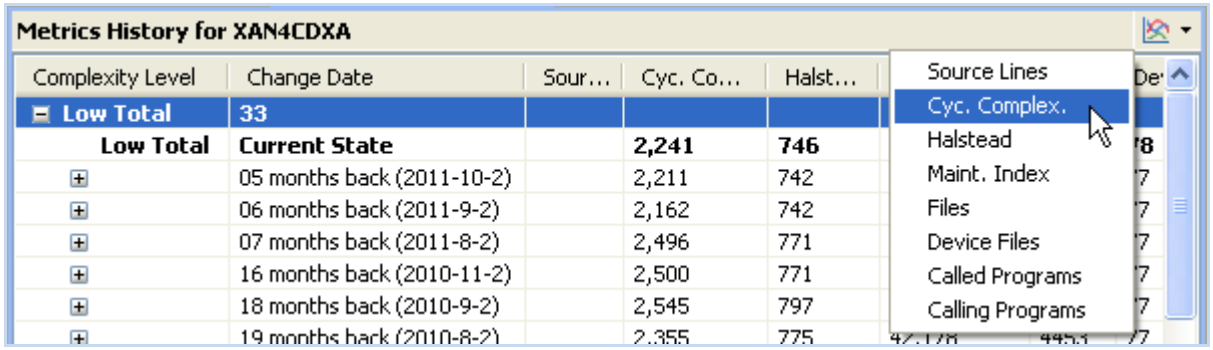
The Metrics Analysis drop down button contains a list of parameters, against which a chart can be generated.

Metrics History Drop Down Options



Select **Cyc. Complex.** option from the drop down menu:

Cyclomatic Complexity Option for Chart



This invokes the Metrics History chart displaying Cyclomatic Complexity:

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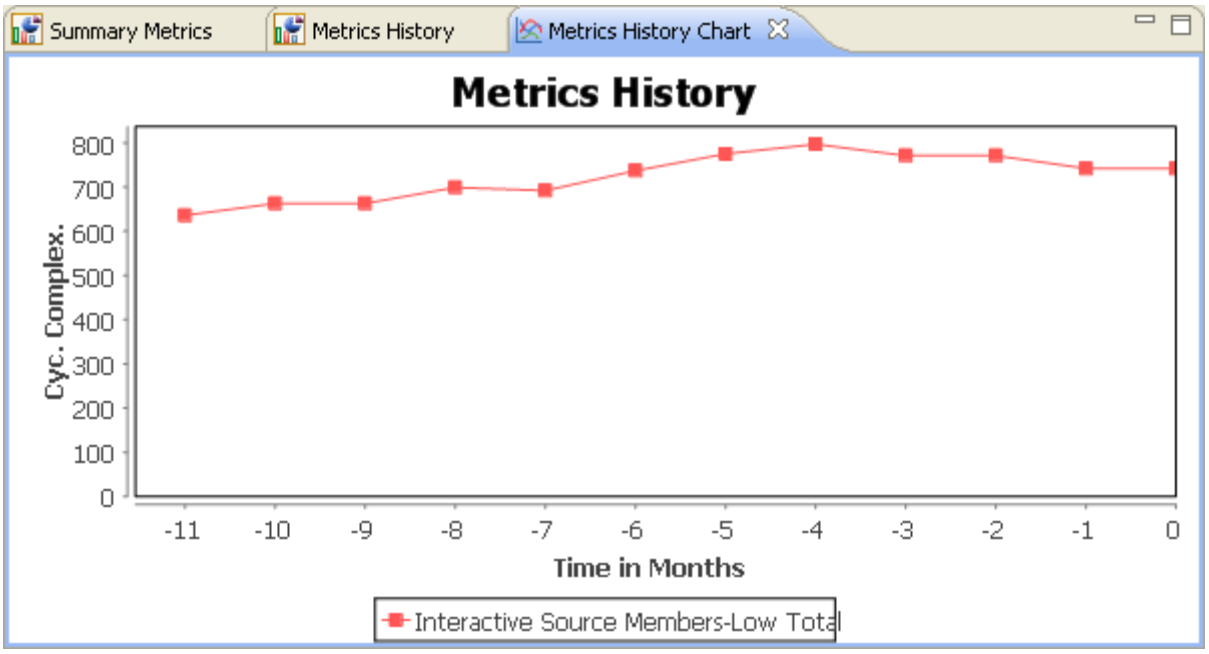
Metrics History Chart Displaying Cyclomatic Complexity



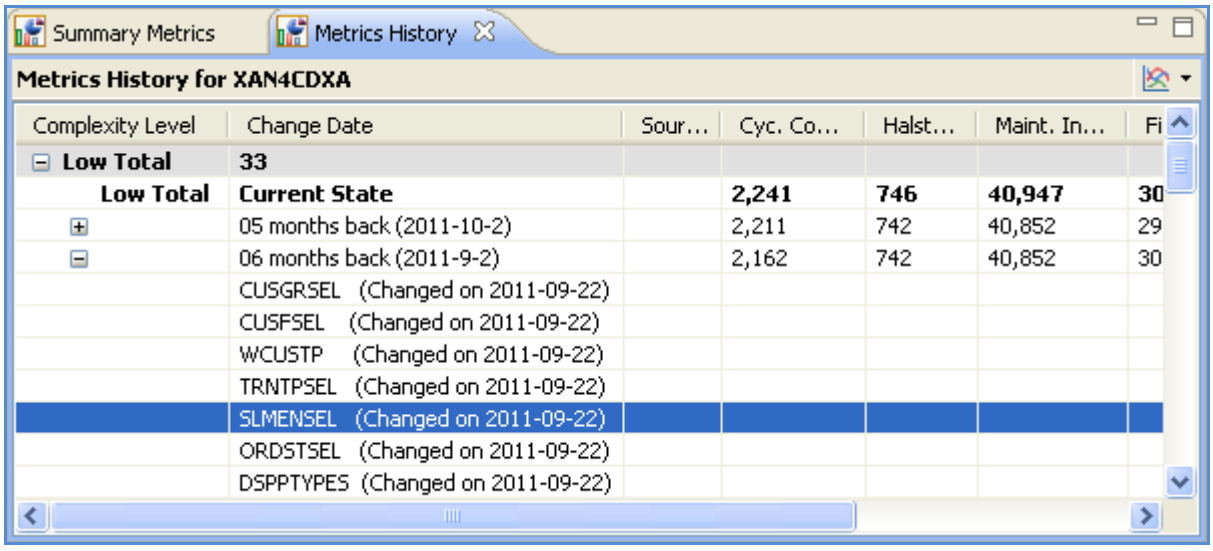
Similarly, a user can generate charts for all the other parameters.

Similarly, user can check Metrics History for all the Interactive / Batch Programs and Grand Total from the Metrics window.

Source code tracking

The Metrics History also provides a facility to see the source code changes. To invoke a source compare editor, expand one of the listed programs from the Metrics History list.

Program Selected for Source Code Comparison



Double click on the selected program to invoke the source compare editor.

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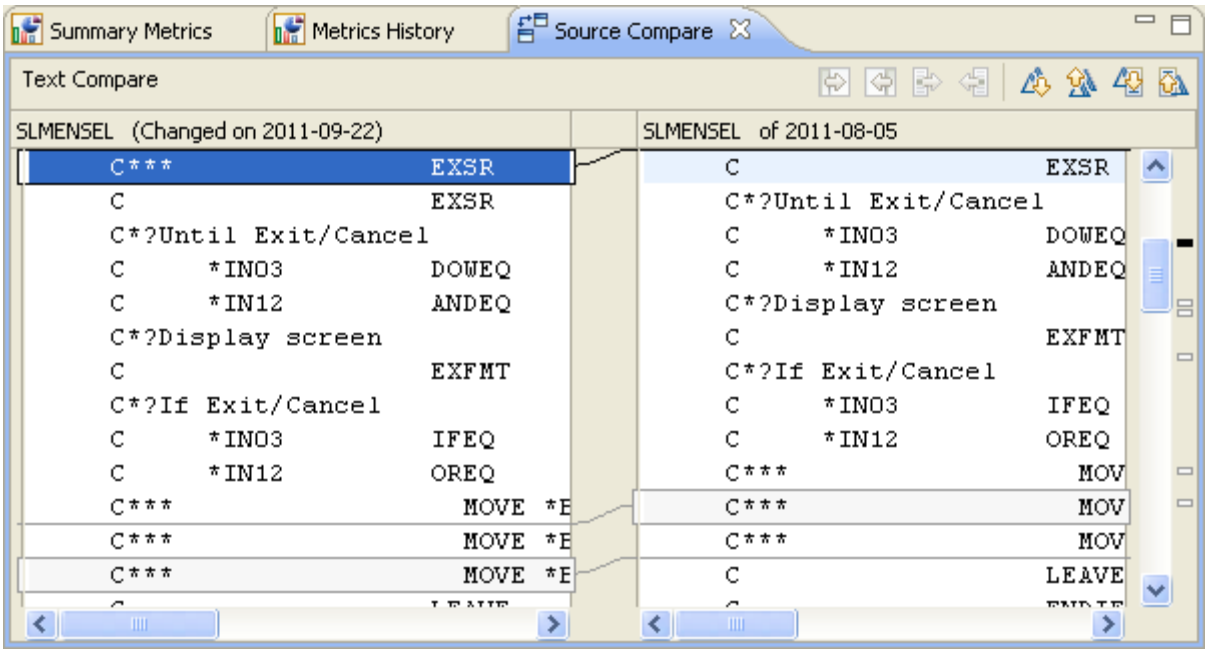
Source Compare Editor displaying the Code Differences



Screen Metrics

There are various screen functions of a specific program. The Screen Metrics is a display of these screen functions for a complete application and for all the application areas.

Screen metrics are designed to help refacing projects and UI rewrites. They describe designs, uses and relationships of file complexities; thus, helping to measure the database complexities.

The Complexity Level on Screen Metrics displays two groups i.e. the Grand Total and Application Area totals. Hereafter, all functions in application areas or cross reference application are grouped on a dual level – of complexity and on type of function.

The 'Screen Metrics' option provides low, medium, and high complexity classification of the available screen functions. The Screen Metrics information displayed for the complete application and its application areas.

The Screen Metrics information displayed under the following headings:

- Grid type functions
- Record type functions
- Other functions

The following screen displays the Screen Metrics information for the cross-reference library XAN4CDXA:

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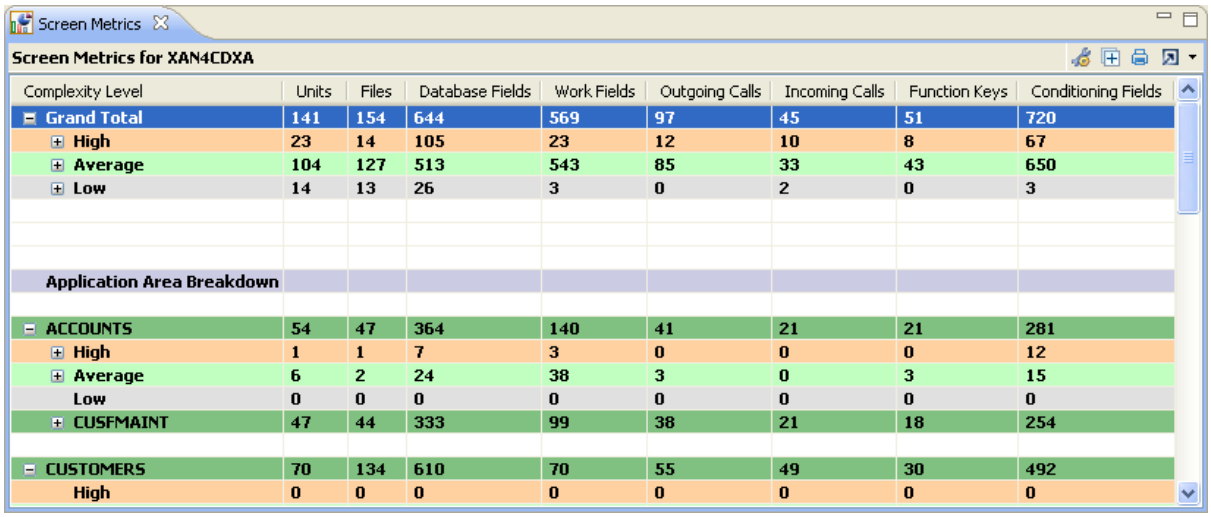
Screen Metrics for cross-reference library XAN4CDXA


Screen Metrics

Screen Metrics for XAN4CDXA

Complexity Level	Units	Files	Database Fields	Work Fields	Outgoing Calls	Incoming Calls	Function Keys	Conditioning Fields
Grand Total	141	154	644	569	97	45	51	720
High	23	14	105	23	12	10	8	67
Average	104	127	513	543	85	33	43	650
Low	14	13	26	3	0	2	0	3
Application Area Breakdown								
ACCOUNTS	54	47	364	140	41	21	21	281
High	1	1	7	3	0	0	0	12
Average	6	2	24	38	3	0	3	15
Low	0	0	0	0	0	0	0	0
CUSFMAINT	47	44	333	99	38	21	18	254
CUSTOMERS	70	134	610	70	55	49	30	492
High	0	0	0	0	0	0	0	0

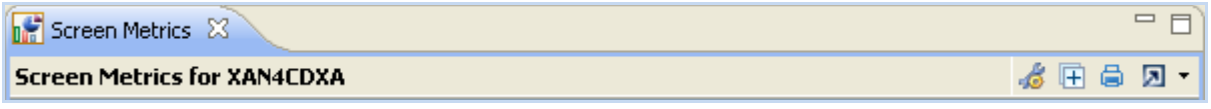
The Metrics information displayed above has the following columns:

1. **Complexity Level:** This shows various groups. The top most group is either Grand Total, or App area totals. All functions in application area or cross-reference application are then grouped based on complexity, and then on type of function
2. **Units:** Shows the number of functions in the group
3. **Files:** Total number of Files used by screen function
4. **Database Fields:** Total number of screen fields which are read from database fields
5. **Work Fields:** Total number of work fields in the group
6. **Outgoing Calls:** Number of functions called by this function
7. **Incoming Call:** Number of functions calling this function
8. **Function Keys:** Total number of Function key-based actions called by functions in this group
9. **Conditioning Fields:** Number of fields on which there is a conditioning logic

Screen Metrics Toolbar

The Screen Metrics toolbar comprises of various options discussed below.

Toolbar available on Screen Metrics Window



Screen Metrics Settings

Each User can set the Screen Metrics settings as per their requirements.

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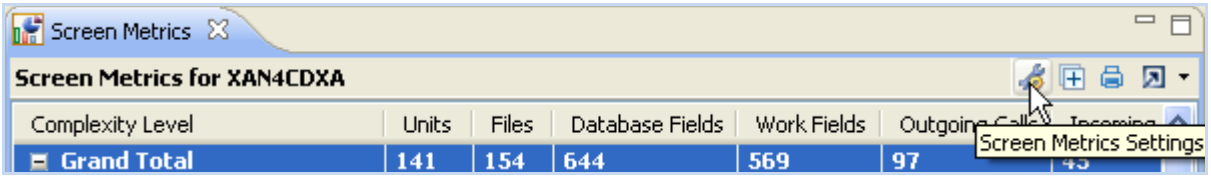
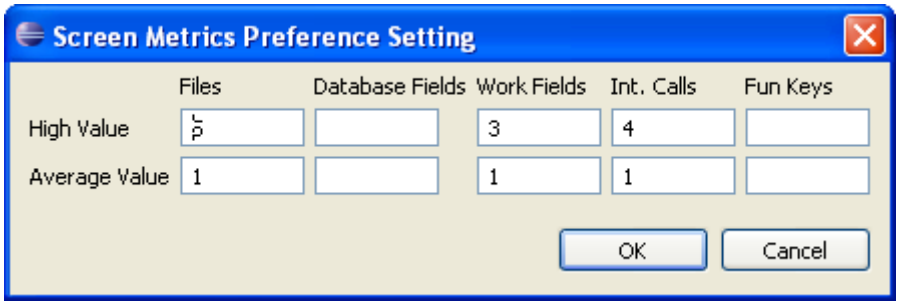
Screen Metrics Settings Button on the Screen Metrics Toolbar



Click the **Screen Metrics Settings** icon to invoke the preferences dialog:

Screen Metrics Preferences Dialog

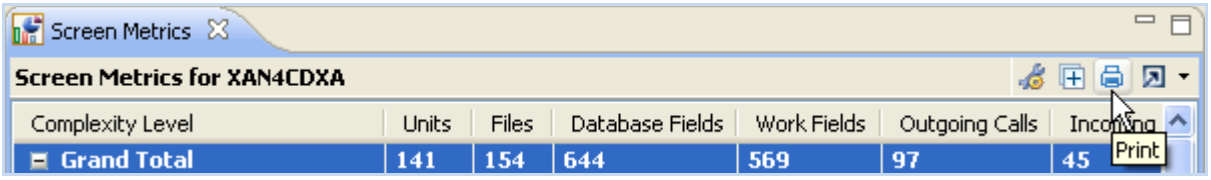


The user can set the criteria for High / Average using the preferences dialog.

Print Screen Metrics

To print the Screen Metrics information, click the **Print** button, available on the toolbar.

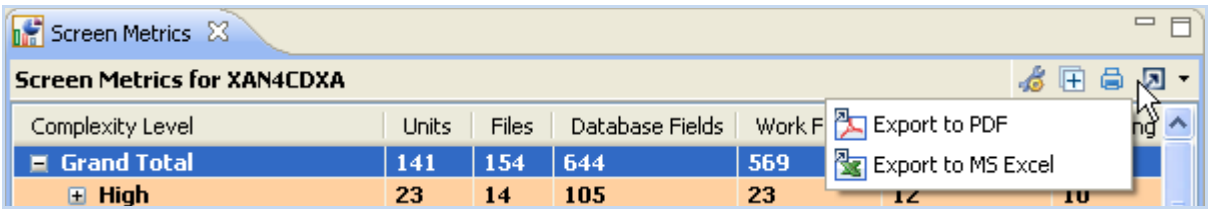
Print Icon on Metrics Toolbar



Export Screen Metrics

Select the PDF or MS Excel option, as required under the 'Export' icon.

Export Options on Screen Metrics Toolbar



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File Metrics

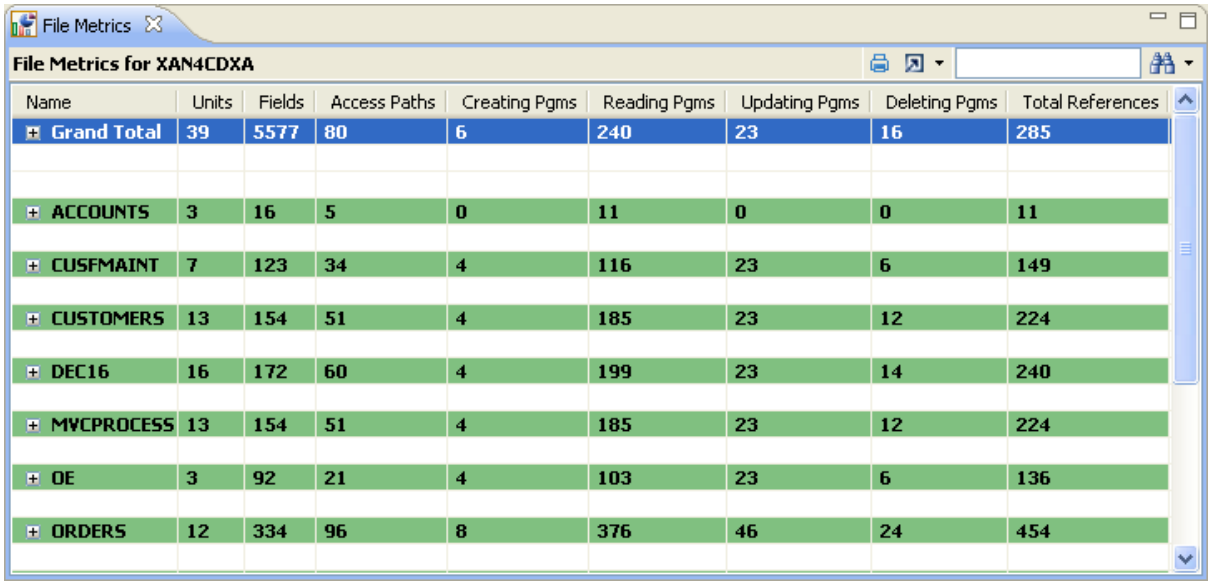
The File Metrics is a display of metrics-related information on all the files. One can overview metrics data for the complete application and/or for all the application areas.

The File Metrics displays information under the following headings:

1. **Units:** Displays total number of Files
2. **Fields:** Displays the total number of fields available in the file
3. **Access Paths:** The total number of access paths for the file
4. **Creating Programs:** The number of programs creating records in this file
5. **Reading Programs:** The number of programs reading this file
6. **Updating Programs:** The number of programs updating records in this file
7. **Deleting Programs:** The number of programs deleting records from this file
8. **Total References:** The total number of programs referencing this file (in effect total of 3 - 6)

The following screen displays the 'File Metrics' information for the cross-reference library XAN4CDXA:

Window displaying File Metrics for the cross-reference library XAN4CDXA



Name	Units	Fields	Access Paths	Creating Pgms	Reading Pgms	Updating Pgms	Deleting Pgms	Total References
Grand Total	39	5577	80	6	240	23	16	285
ACCOUNTS	3	16	5	0	11	0	0	11
CUSFMAINT	7	123	34	4	116	23	6	149
CUSTOMERS	13	154	51	4	185	23	12	224
DEC16	16	172	60	4	199	23	14	240
MYCPROCESS	13	154	51	4	185	23	12	224
OE	3	92	21	4	103	23	6	136
ORDERS	12	334	96	8	376	46	24	454

Business Process Logic Metrics

The Business Process Logic Metrics report displays the migrated logic data in metrics form - total lines, included lines, excluded lines, unmarked lines etc.

The following screen displays the Business Process Logic Audit Report for a XAN4CDXA:

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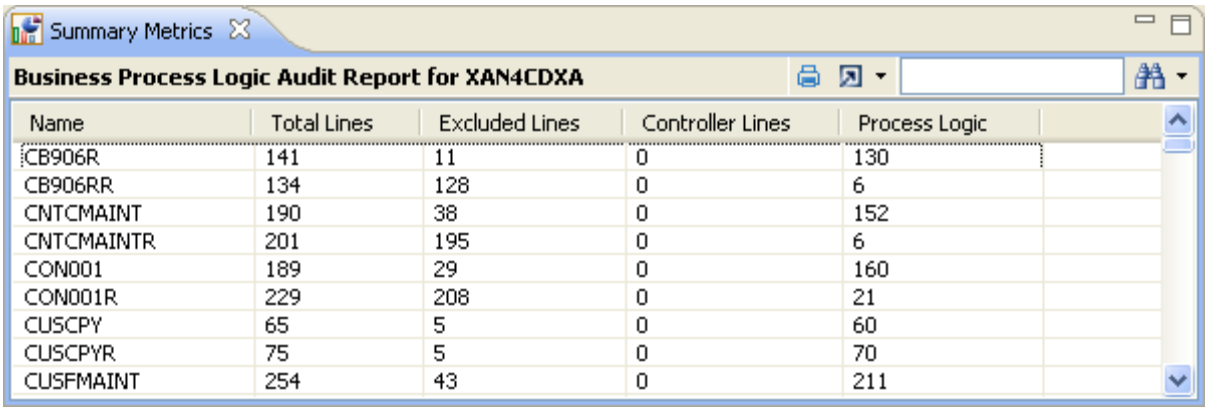
Business Process Logic Audit Report for XAN4CDXA



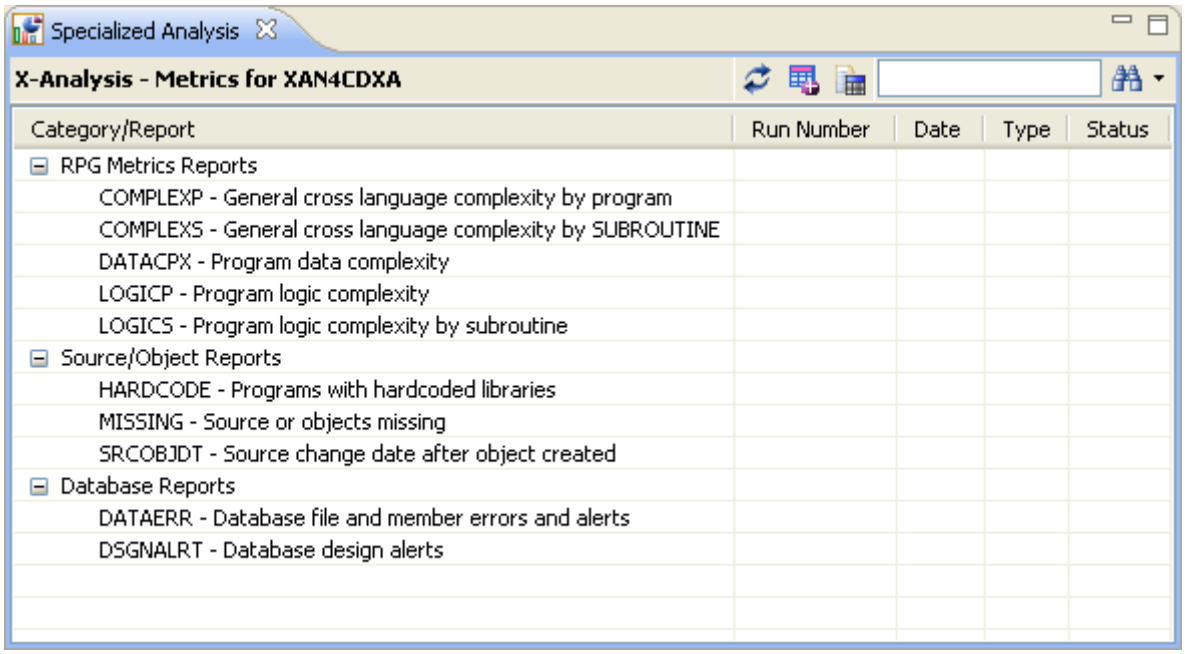
Name	Total Lines	Excluded Lines	Controller Lines	Process Logic
CB906R	141	11	0	130
CB906RR	134	128	0	6
CNTCMAINT	190	38	0	152
CNTCMAINTR	201	195	0	6
CON001	189	29	0	160
CON001R	229	208	0	21
CUSCPY	65	5	0	60
CUSCPYR	75	5	0	70
CUSFMAINT	254	43	0	211

Specialized Analysis

Measuring and managing the quality and complexity of a code base is the topmost priority for a systems analyst. Specialized Analysis is an invaluable feature that allows one complete freedom to create customized reports using the full metrics database in the defined system repository. One can choose to view the report as a Static Report or a Difference Report. The latter plots changes in values over a period, giving a better idea of measurement.

Opt for the **Specialized Analysis** option from the sub menu 'Audit Options'. The following screen displays the Specialized Analysis window:

Specialized Analysis Window for XAN4CDXA



Category/Report	Run Number	Date	Type	Status
RPG Metrics Reports				
COMPLEXP - General cross language complexity by program				
COMPLEXS - General cross language complexity by SUBROUTINE				
DATACPX - Program data complexity				
LOGICP - Program logic complexity				
LOGICS - Program logic complexity by subroutine				
Source/Object Reports				
HARDCODE - Programs with hardcoded libraries				
MISSING - Source or objects missing				
SRCOBJDT - Source change date after object created				
Database Reports				
DATAERR - Database file and member errors and alerts				
DSGNALRT - Database design alerts				

The user has an option to generate the pre-configured reports. Select any report from the listed category and opt for the context menu, as shown below:

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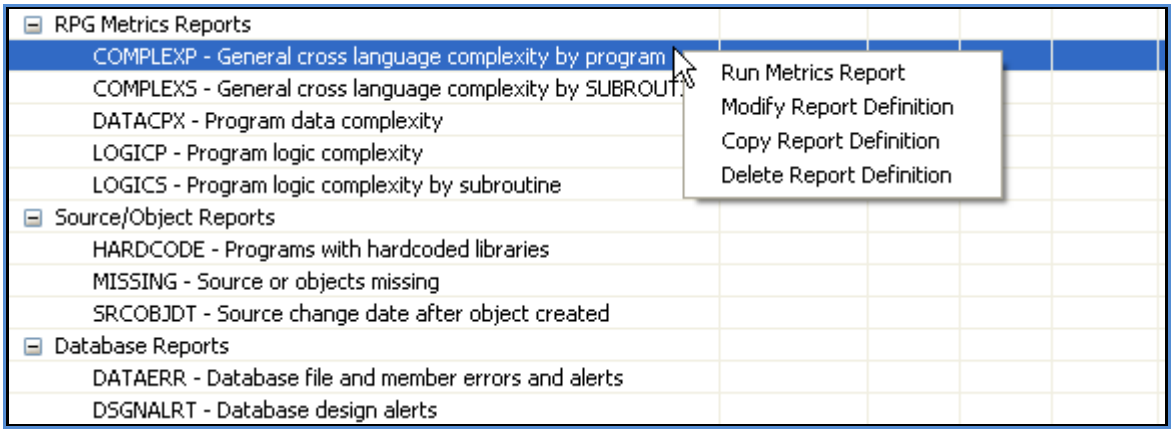
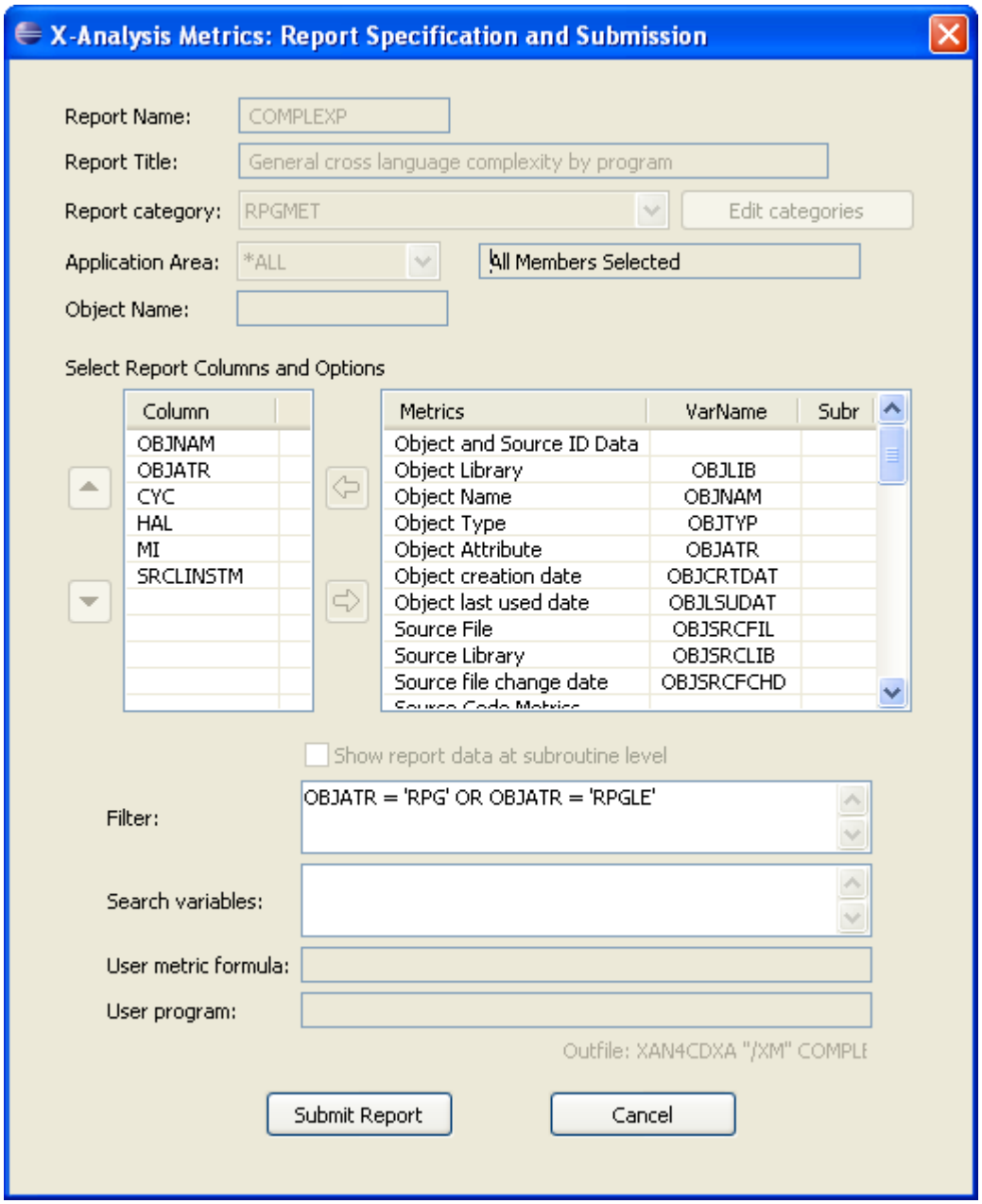
Context Menu on Report Definition


RPG Metrics Reports
COMPLEXP - General cross language complexity by program
COMPLEXS - General cross language complexity by SUBROUT
DATACPX - Program data complexity
LOGICP - Program logic complexity
LOGICS - Program logic complexity by subroutine
Source/Object Reports
HARDCODE - Programs with hardcoded libraries
MISSING - Source or objects missing
SRCOBJDT - Source change date after object created
Database Reports
DATAERR - Database file and member errors and alerts
DSGNALRT - Database design alerts
Run Metrics Report
Modify Report Definition
Copy Report Definition
Delete Report Definition

Run Metrics Report

When user opts for this option, the pre-configured report dialog invokes:

Report Definition Dialog



Click the **Submit Report** to generate the report. A batch job submitted and on its completion, the Specialized Analysis window updates itself:

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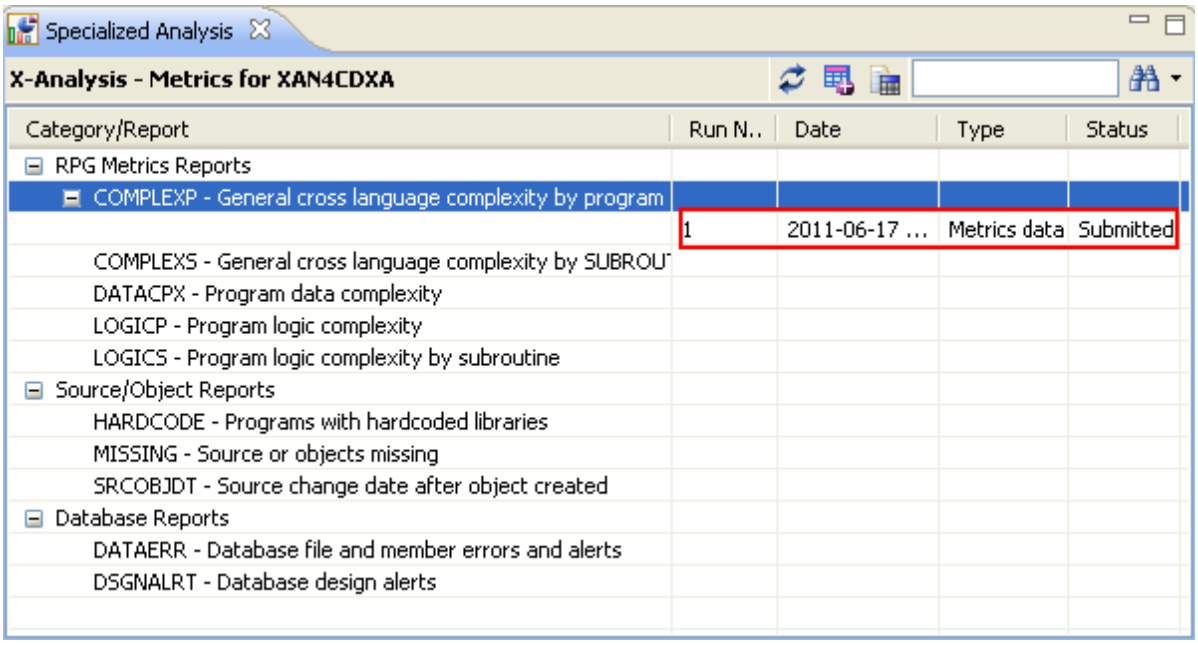
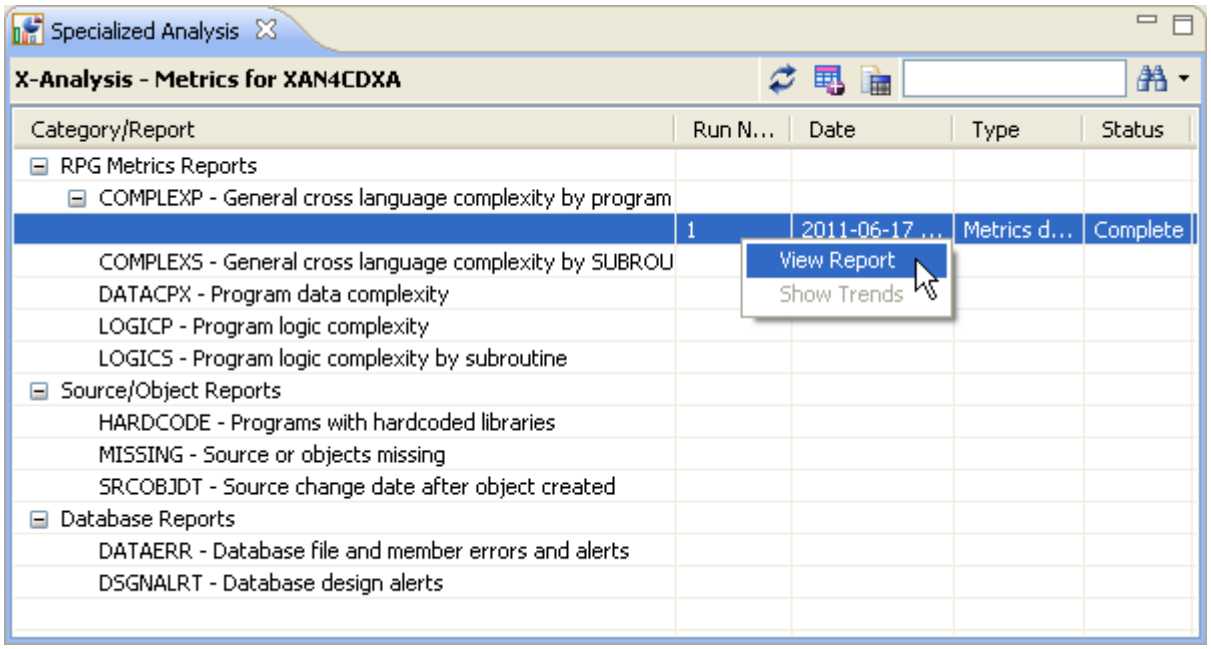
Specialized Analysis Window



To view the generated report, select report and opt for 'View Report' option from the context menu.

Updated Specialized Analysis Window



The report displayed as under:

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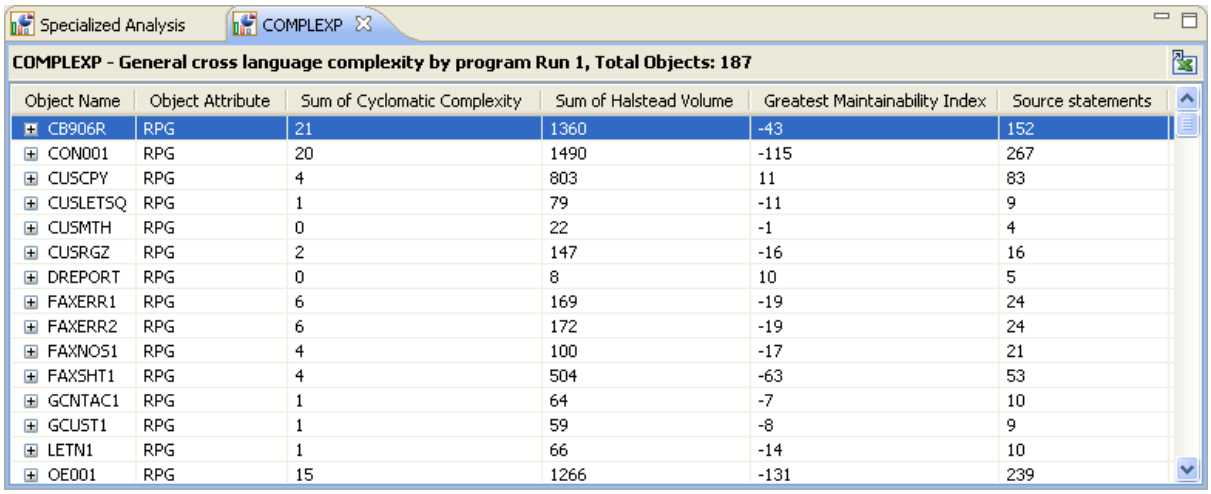
COMPLEX Report



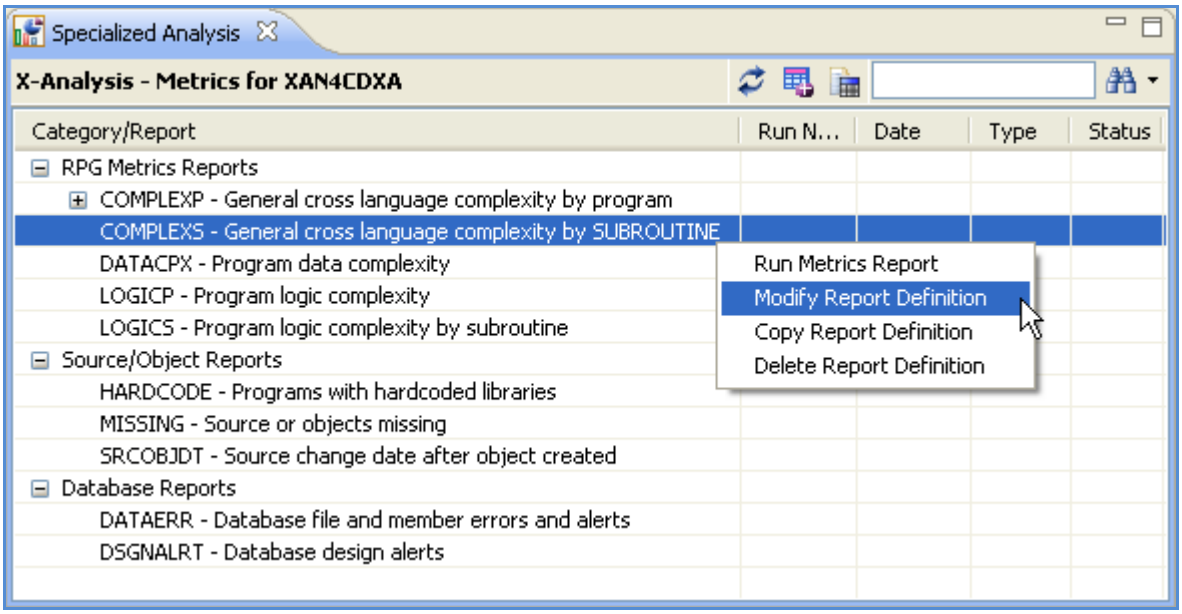
Object Name	Object Attribute	Sum of Cyclomatic Complexity	Sum of Halstead Volume	Greatest Maintainability Index	Source statements
CB906R	RPG	21	1360	-43	152
CON001	RPG	20	1490	-115	267
CUSCPY	RPG	4	803	11	83
CUSLETSQ	RPG	1	79	-11	9
CUSMTH	RPG	0	22	-1	4
CUSRGZ	RPG	2	147	-16	16
DREPORT	RPG	0	8	10	5
FAXERR1	RPG	6	169	-19	24
FAXERR2	RPG	6	172	-19	24
FAXNOS1	RPG	4	100	-17	21
FAXSHT1	RPG	4	504	-63	53
GCNTAC1	RPG	1	64	-7	10
GCUST1	RPG	1	59	-8	9
LETN1	RPG	1	66	-14	10
OE001	RPG	15	1266	-131	239

If required, the user can export this report to MS Excel.

Modify Report Definition

User has the option to modify an existing report definition.

Modify Report Definition Option


Specialized Analysis
X-Analysis - Metrics for XAN4CDXA
Category/Report
Run N...
Date
Type
Status
RPG Metrics Reports
COMPLEXP - General cross language complexity by program
COMPLEXS - General cross language complexity by SUBROUTINE
DATACPX - Program data complexity
LOGICP - Program logic complexity
LOGICS - Program logic complexity by subroutine
Source/Object Reports
HARDCODE - Programs with hardcoded libraries
MISSING - Source or objects missing
SRCOBJDT - Source change date after object created
Database Reports
DATAERR - Database file and member errors and alerts
DSGNALRT - Database design alerts
Run Metrics Report
Modify Report Definition
Copy Report Definition
Delete Report Definition

Select **Modify Report Definition** option to invoke the report configuration dialog:

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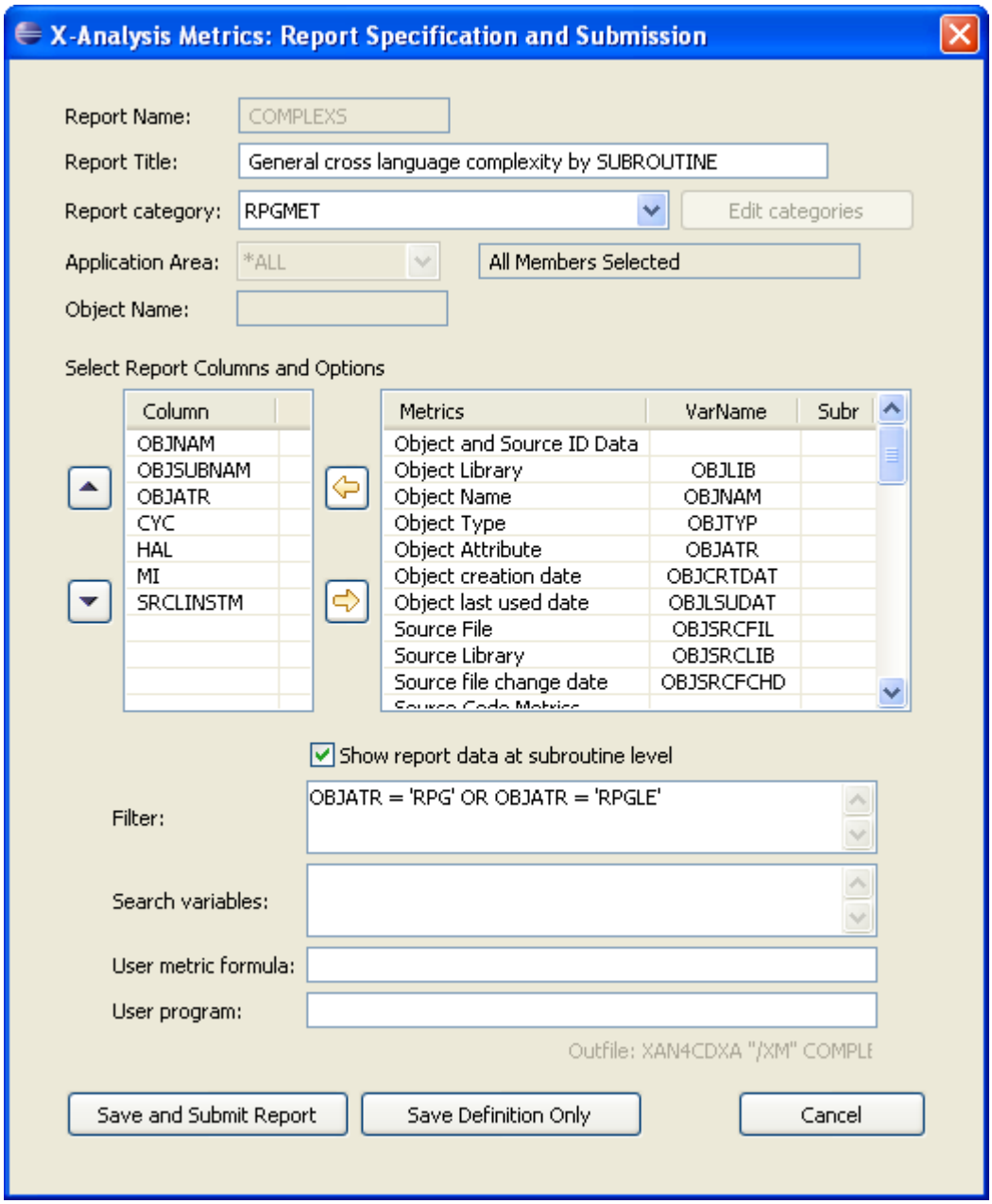
Report Definition Dialog



After changing the report definition, click the **Save Definition Only** button. User can click the **Save and Submit Report** to generate a report.

Copy Report Definition

The user has the option to copy an existing report definition. This shall retain an existing report and allow having a customised report.

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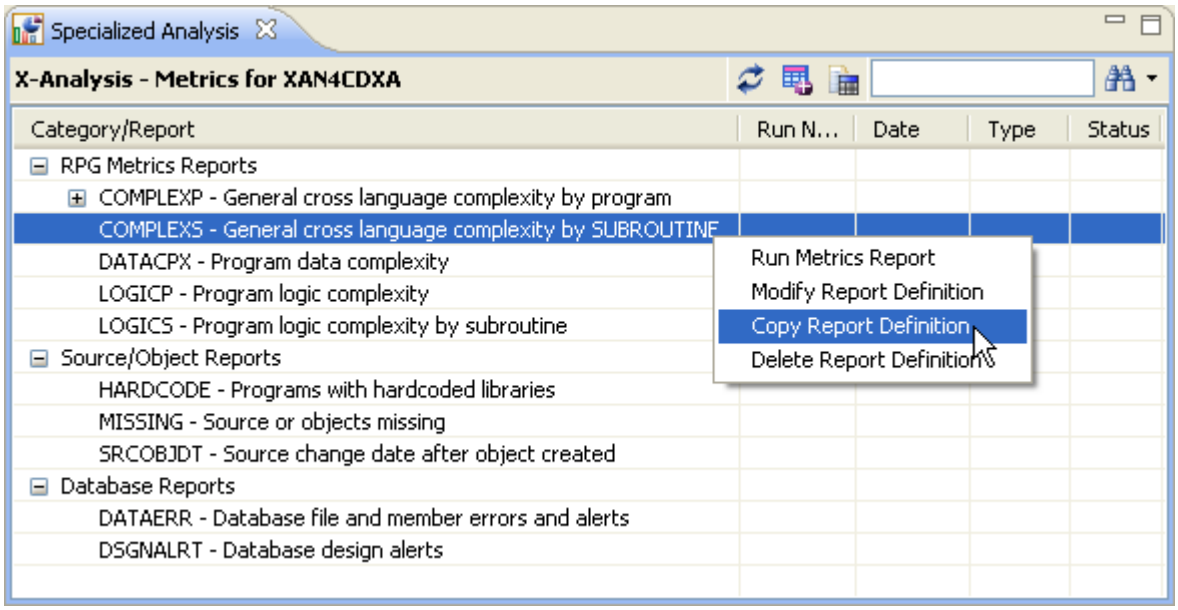
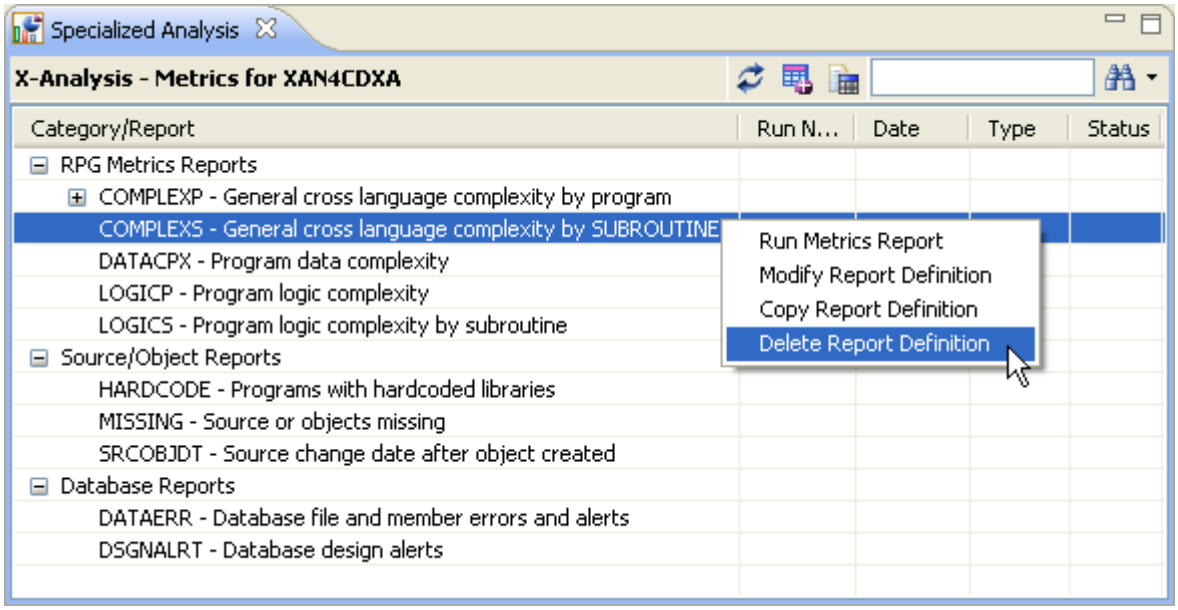
Copy Report Definition Option


Specialized Analysis
X-Analysis - Metrics for XAN4CDXA
Category/Report
Run N...
Date
Type
Status
RPG Metrics Reports
COMPLEXP - General cross language complexity by program
COMPLEXS - General cross language complexity by SUBROUTINE
DATACPX - Program data complexity
LOGICP - Program logic complexity
LOGICS - Program logic complexity by subroutine
Source/Object Reports
HARDCODE - Programs with hardcoded libraries
MISSING - Source or objects missing
SRCOBJDT - Source change date after object created
Database Reports
DATAERR - Database file and member errors and alerts
DSGNALRT - Database design alerts
Run Metrics Report
Modify Report Definition
Copy Report Definition
Delete Report Definition

Delete Report Definition

If required, the user can delete an existing report definition.

Delete Report Definition Option


Specialized Analysis
X-Analysis - Metrics for XAN4CDXA
Category/Report
Run N...
Date
Type
Status
RPG Metrics Reports
COMPLEXP - General cross language complexity by program
COMPLEXS - General cross language complexity by SUBROUTINE
DATACPX - Program data complexity
LOGICP - Program logic complexity
LOGICS - Program logic complexity by subroutine
Source/Object Reports
HARDCODE - Programs with hardcoded libraries
MISSING - Source or objects missing
SRCOBJDT - Source change date after object created
Database Reports
DATAERR - Database file and member errors and alerts
DSGNALRT - Database design alerts
Run Metrics Report
Modify Report Definition
Copy Report Definition
Delete Report Definition

Specialized Analysis Toolbar

The Specialized Analysis toolbar comprises various options discussed below.

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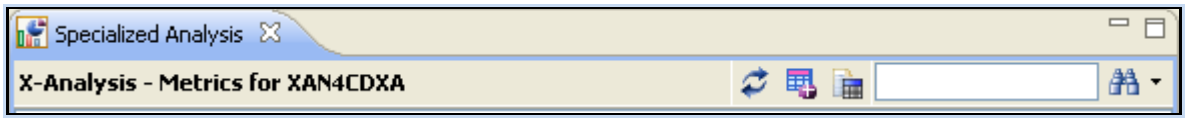
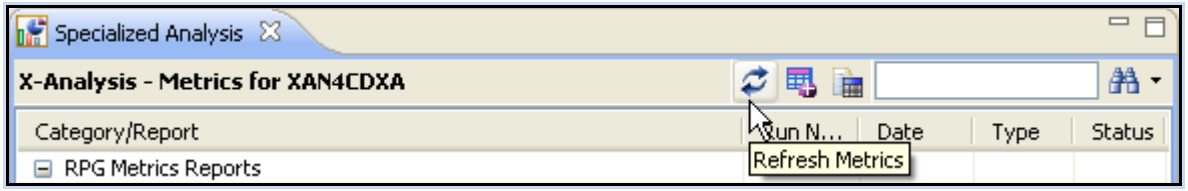
Specialized Analysis Toolbar



Refresh Metrics

The Refresh Metrics icon performs the refresh function.

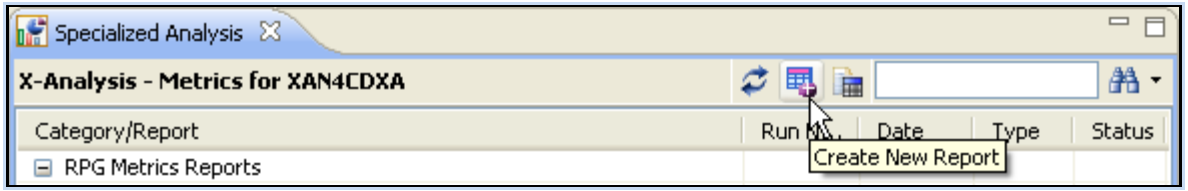
Refresh Icon on Specialized Analysis Toolbar



Create New Report

If required the user can create a customised report. Use **Create New Report** icon for this.

Create New Report Icon on Specialized Analysis Toolbar



The ‘Create New Report’ icon invokes the report definition dialog.

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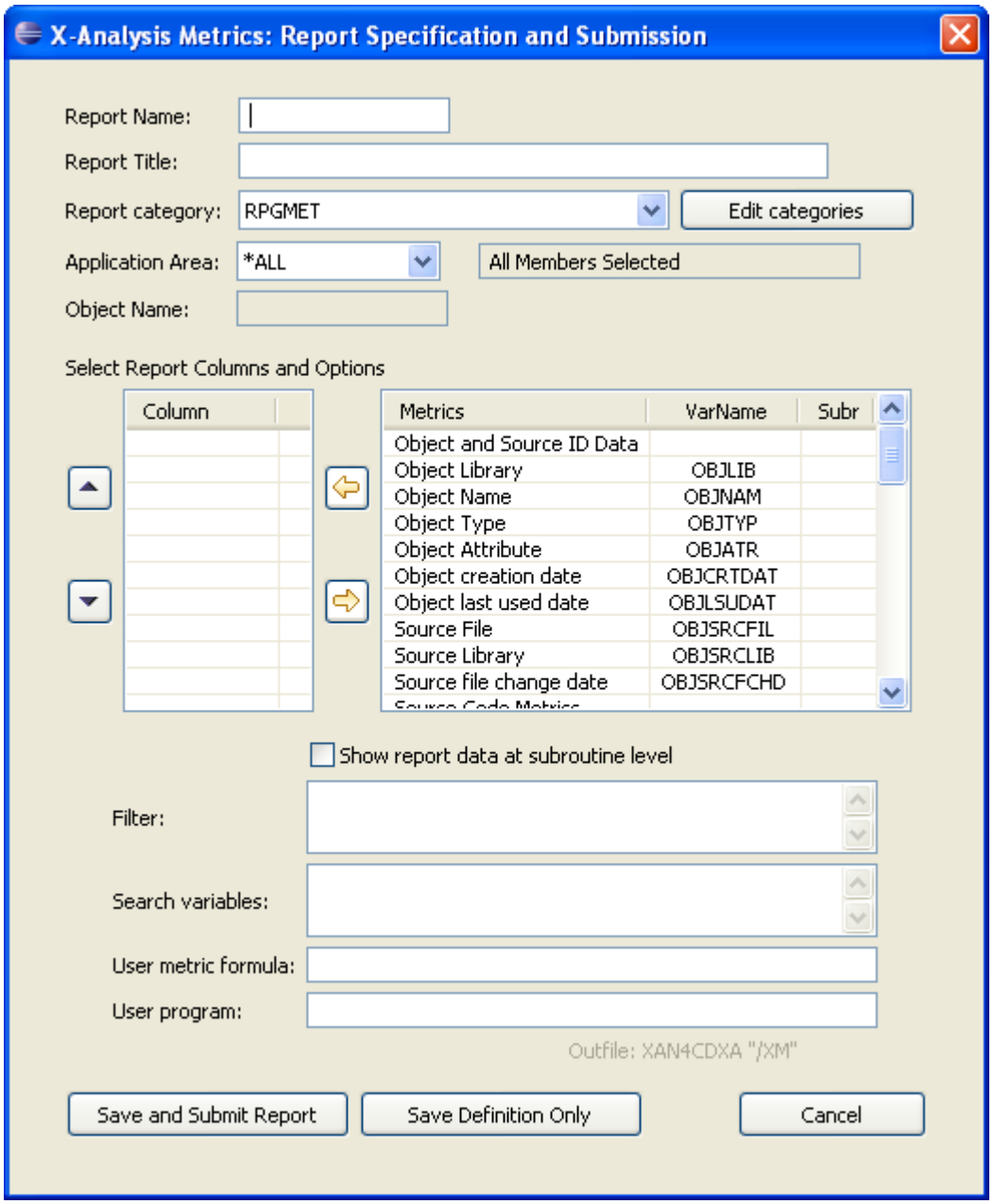
Create New Report Dialog



View Log

The 'View Log' icon shows the log related to the Metrics processing.

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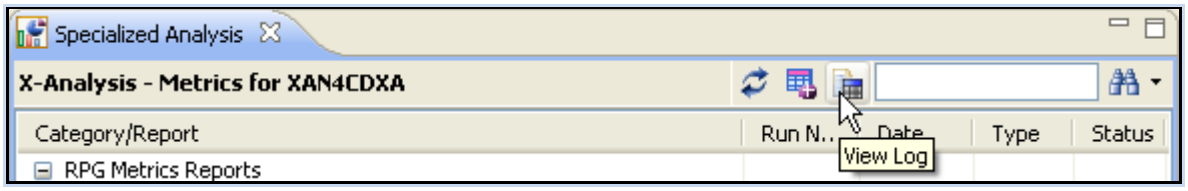
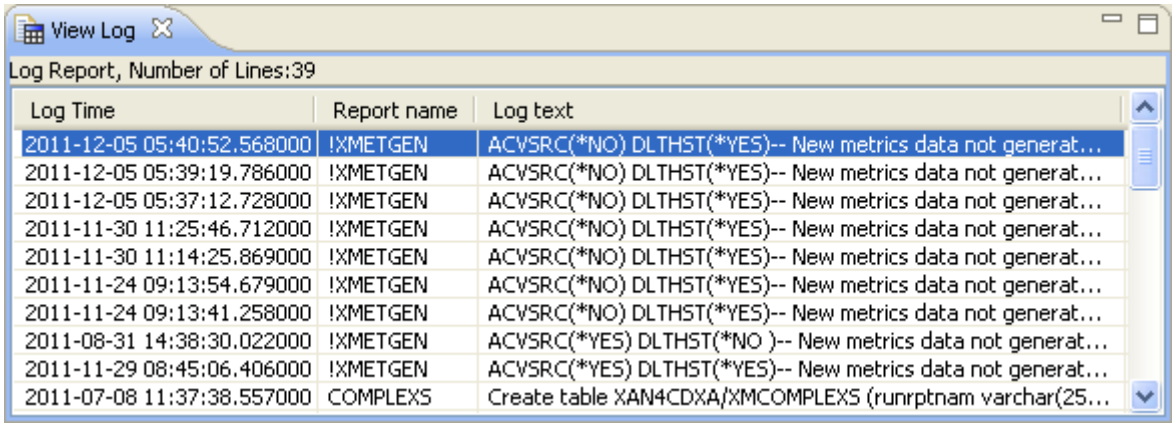
View Log Icon on Specialized Analysis Toolbar



Click the **View Log** icon to check the log.

View Log Window


View Log
Log Report, Number of Lines:39
Log Time
Report name
Log text
2011-12-05 05:40:52.568000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-12-05 05:39:19.786000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-12-05 05:37:12.728000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-11-30 11:25:46.712000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-11-30 11:14:25.869000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-11-24 09:13:54.679000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-11-24 09:13:41.258000 !XMETGEN ACVSRC(*NO) DLTHST(*YES)-- New metrics data not generat...
2011-08-31 14:38:30.022000 !XMETGEN ACVSRC(*YES) DLTHST(*NO)-- New metrics data not generat...
2011-11-29 08:45:06.406000 !XMETGEN ACVSRC(*YES) DLTHST(*YES)-- New metrics data not generat...
2011-07-08 11:37:38.557000 COMPLEXS Create table XAN4CDXA/XMCOMPLEXS (runrptnam varchar(25...

Problem Analysis

One way of improving the quality of analytical procedures is to have prior knowledge of any existing inaccuracies in the data. There are issues like object with no source and vice versa, or the source is changed after object creation date, or duplicate logical files etc. These can prove to be stumbling blocks in the path to achieving superior and up-to-date analyses.

The Problem Analysis feature warns the user about any such discrepancies in the data. The feature has an expandable Problem Category section, which gives names of individual files having a particular problem.

To display the Problem Analysis data, select the ‘Problem Analysis’ option from the ‘Audit Options’ under the context menu on XAN4CDXA.

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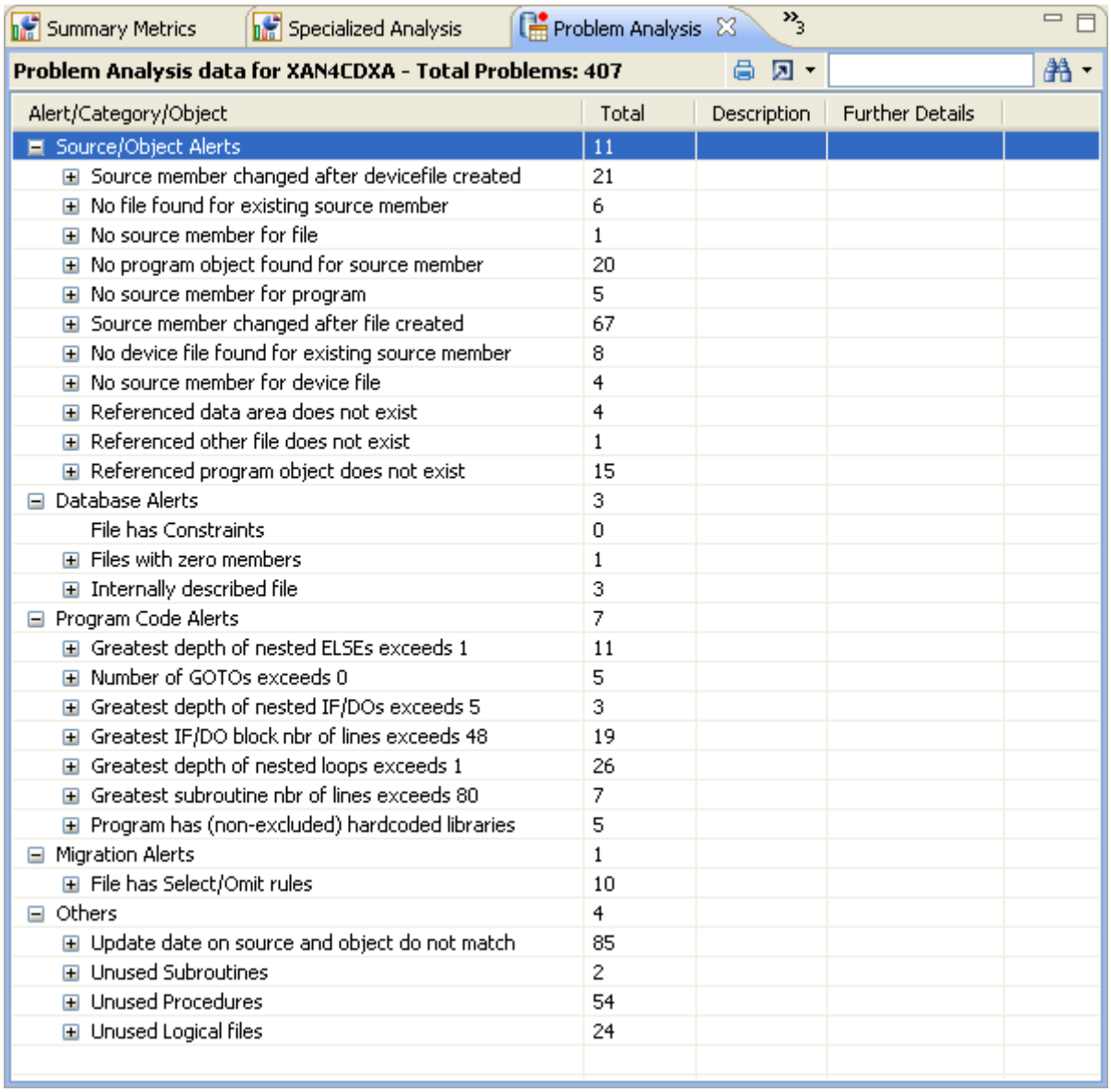
Problem Analysis for cross-reference library XAN4CDXA



Alert/Category/Object	Total	Description	Further Details
Source/Object Alerts	11		
Source member changed after devicefile created	21		
No file found for existing source member	6		
No source member for file	1		
No program object found for source member	20		
No source member for program	5		
Source member changed after file created	67		
No device file found for existing source member	8		
No source member for device file	4		
Referenced data area does not exist	4		
Referenced other file does not exist	1		
Referenced program object does not exist	15		
Database Alerts	3		
File has Constraints	0		
Files with zero members	1		
Internally described file	3		
Program Code Alerts	7		
Greatest depth of nested ELSEs exceeds 1	11		
Number of GOTOs exceeds 0	5		
Greatest depth of nested IF/DOs exceeds 5	3		
Greatest IF/DO block nbr of lines exceeds 48	19		
Greatest depth of nested loops exceeds 1	26		
Greatest subroutine nbr of lines exceeds 80	7		
Program has (non-excluded) hardcoded libraries	5		
Migration Alerts	1		
File has Select/Omit rules	10		
Others	4		
Update date on source and object do not match	85		
Unused Subroutines	2		
Unused Procedures	54		
Unused Logical files	24		

Expand the ‘Problem Category’ section to view the objects having problem.

Object Allocation

The ‘Object Allocation’ window displays the information about all the objects along with the application area names to which they belong. The following screen displays the object allocation window:

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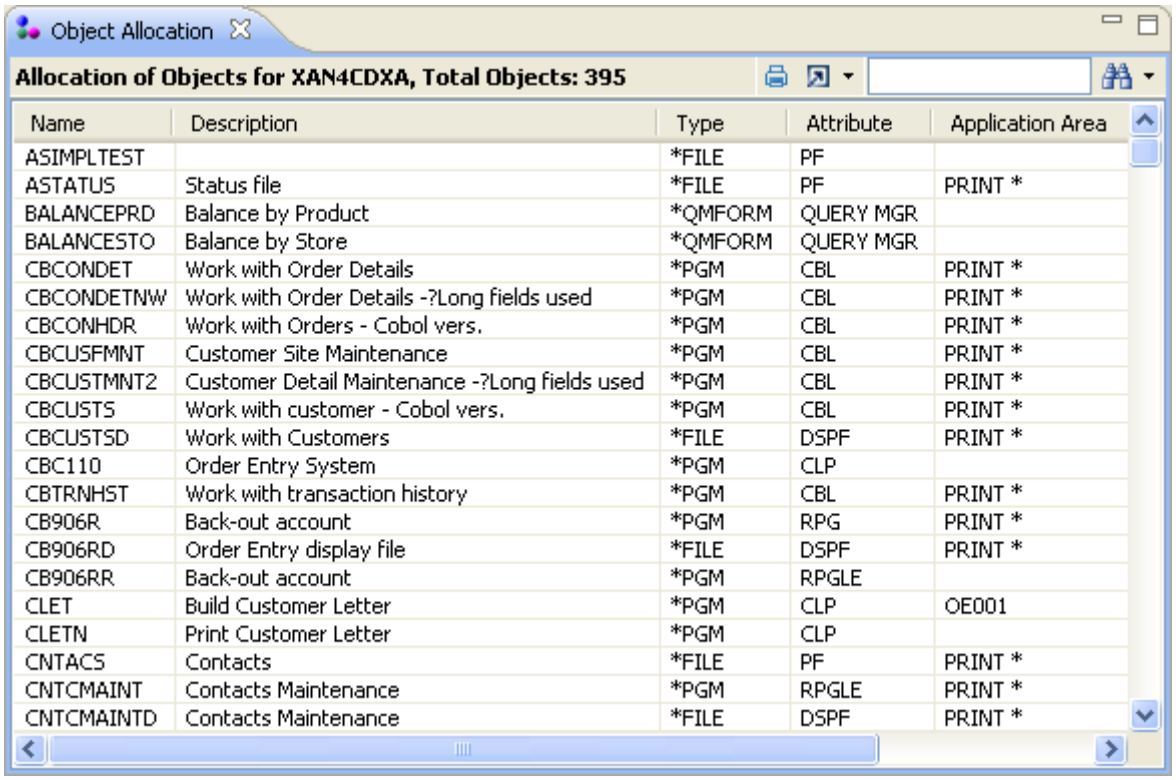
Object Allocation for XAN4CDXA



Name	Description	Type	Attribute	Application Area
ASIMPLTEST		*FILE	PF	
ASTATUS	Status file	*FILE	PF	PRINT *
BALANCEPRD	Balance by Product	*QMFORM	QUERY MGR	
BALANCESTO	Balance by Store	*QMFORM	QUERY MGR	
CBCONDET	Work with Order Details	*PGM	CBL	PRINT *
CBCONDETNW	Work with Order Details -?Long fields used	*PGM	CBL	PRINT *
CBCONHDR	Work with Orders - Cobol vers.	*PGM	CBL	PRINT *
CBCUSFMNT	Customer Site Maintenance	*PGM	CBL	PRINT *
CBCUSTMNT2	Customer Detail Maintenance -?Long fields used	*PGM	CBL	PRINT *
CBCUSTS	Work with customer - Cobol vers.	*PGM	CBL	PRINT *
CBCUSTSD	Work with Customers	*FILE	DSPF	PRINT *
CBC110	Order Entry System	*PGM	CLP	
CBTRNHST	Work with transaction history	*PGM	CBL	PRINT *
CB906R	Back-out account	*PGM	RPG	PRINT *
CB906RD	Order Entry display file	*FILE	DSPF	PRINT *
CB906RR	Back-out account	*PGM	RPGLE	
CLET	Build Customer Letter	*PGM	CLP	OE001
CLETN	Print Customer Letter	*PGM	CLP	
CNTACS	Contacts	*FILE	PF	PRINT *
CNTCMAINT	Contacts Maintenance	*PGM	RPGLE	PRINT *
CNTCMAINTD	Contacts Maintenance	*FILE	DSPF	PRINT *

The above screen lists all objects from the application library XAN4CDXA and provides information about the application area. Note that some rows are blank under the application area column, which means that the object does not belong to any application area. Similarly, note the '*' sign, which means that the object belongs to multiple application areas.

Summary Report

The 'Summary Report' option generates structured report for the Metrics Analysis and the Problem analysis as a PDF / MS Word document. Select **Summary Report** option, available under the sub menu 'Audit Options' from the context menu on XAN4CDXA. This invokes the following documentation wizard:

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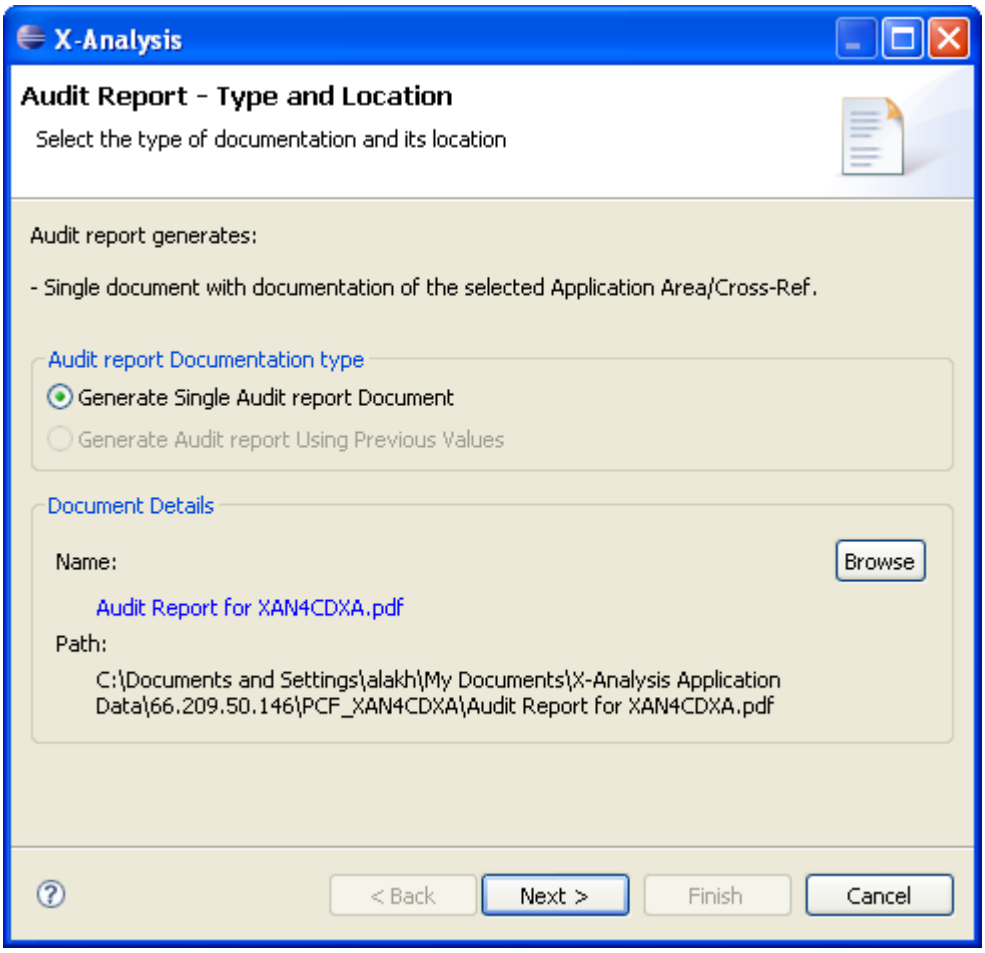
Summary Report - Type and Location



Specify the 'Type and Location' information and click the **Next** button.

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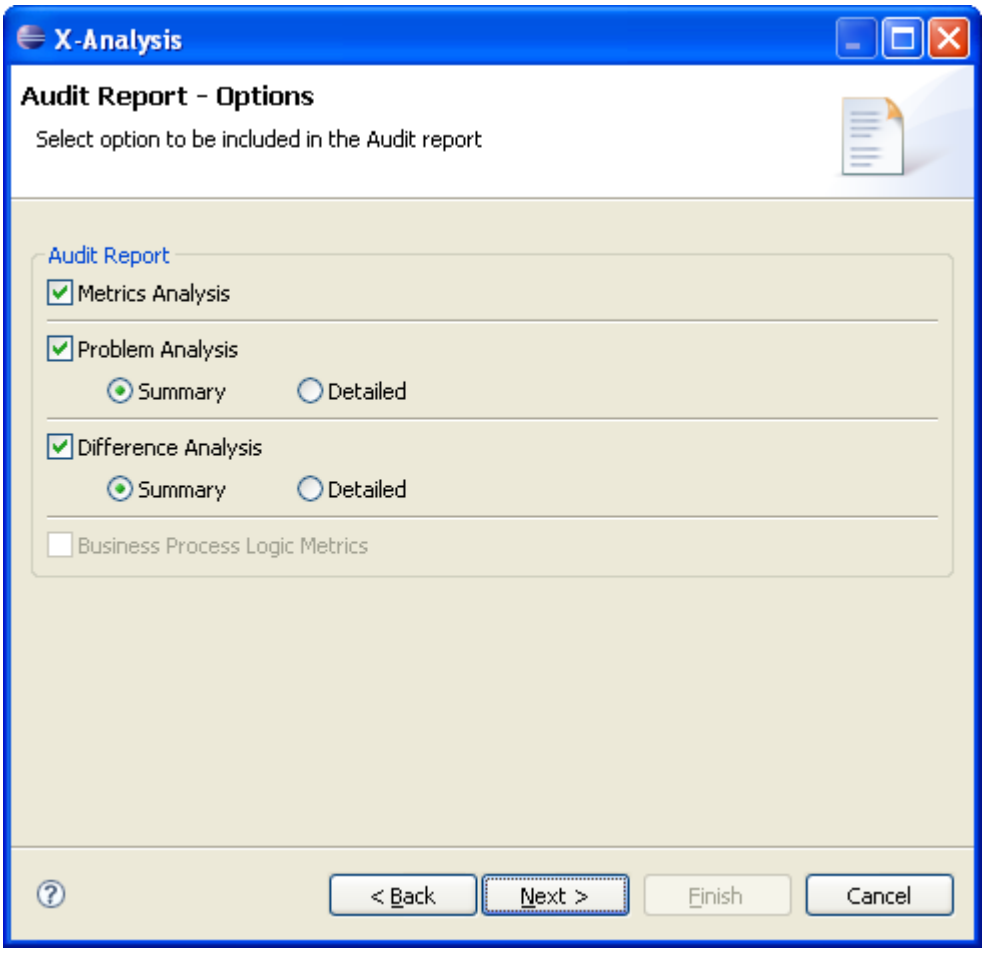
Summary Report - Options



Mark the options to be included in the audit report and click the **Next** button.

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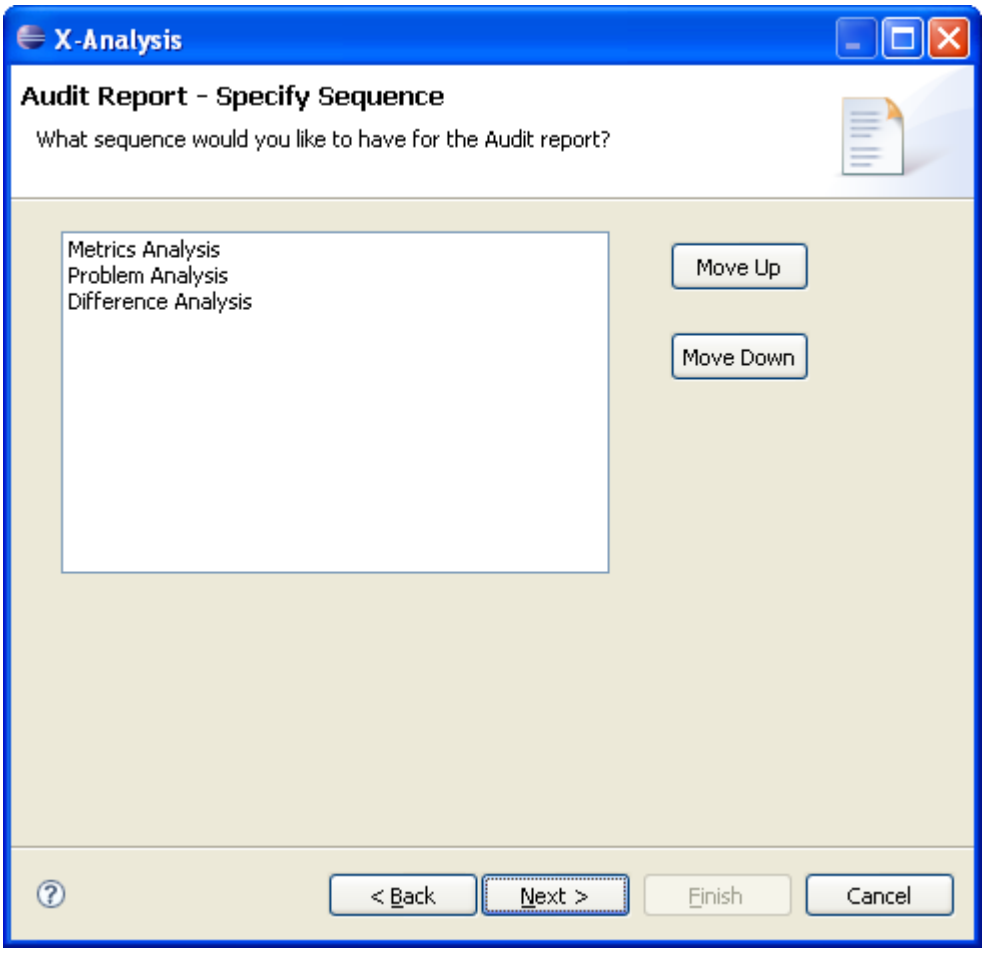
Summary Report - Specify Sequence



Specify the sequence of the contents for the audit report and click the **Next** button.

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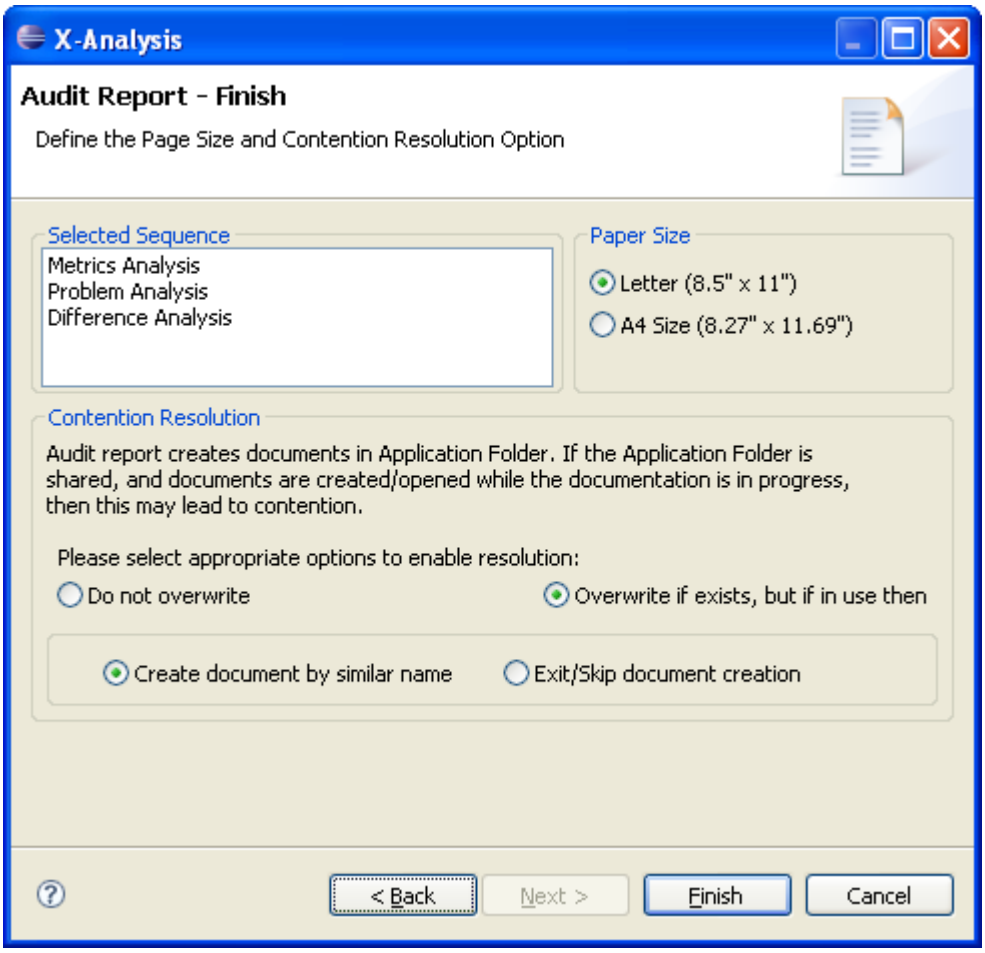
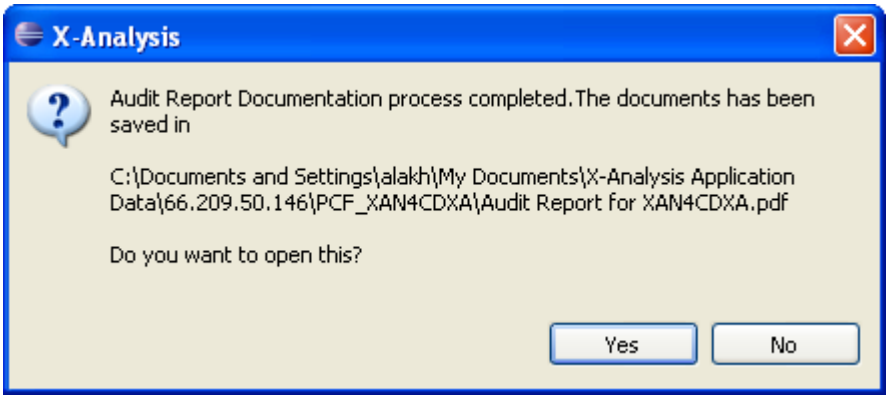
Summary Report - Finish


X-Analysis
Audit Report - Finish
Define the Page Size and Contention Resolution Option
Selected Sequence
Metrics Analysis
Problem Analysis
Difference Analysis
Paper Size
Letter (8.5" x 11")
A4 Size (8.27" x 11.69")
Contention Resolution
Audit report creates documents in Application Folder. If the Application Folder is shared, and documents are created/opened while the documentation is in progress, then this may lead to contention.
Please select appropriate options to enable resolution:
Do not overwrite
Overwrite if exists, but if in use then
Create document by similar name
Exit/Skip document creation
< Back
Next >
Finish
Cancel

Choose the desired settings for the audit report and click the **Finish** button to end the report configuration and generate the report. When the report generation is over, the following dialog appears:

X-Analysis Dialog to open the generated report


X-Analysis
Audit Report Documentation process completed.The documents has been saved in
C:\Documents and Settings\alakh\My Documents\X-Analysis Application Data\66.209.50.146\PCF_XAN4CDXA\Audit Report for XAN4CDXA.pdf
Do you want to open this?
Yes
No

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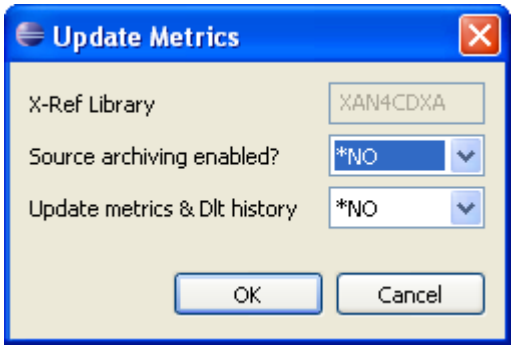
Generate Metrics Analysis

The 'Generates Metrics Analysis' option generates the Metrics data. The dialog shown below invokes, when a user opts for **Generate Metrics** option:

Generate Metrics Dialog

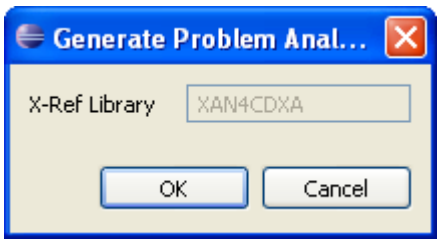


When user clicks the **OK** button, related batch job initiates.

Generate Problem Analysis

The 'Generate Problem Analysis' analyzes the application database files and reports problems. Select **Generate Problem Analysis** option, available under the sub menu 'Audit Options' from the context menu on XAN4CDXA. This invokes the following dialog:

Generate Problem Analysis Dialog



Click the **OK** button to invoke the related batch job command.

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Chapter 7: What's Next

We just saw how X-Analysis with its host of features, makes working of a legacy application easy to understand. We also experienced how X-Analysis helps in analyzing one big application as smaller logical business areas. Its enhanced Data Modelling feature not only exposes the Business Rules implicit in the data and the process models of an application but also digs out the vast amount of business logic buried inside the source code of the programs.

Over two decades of dedicated research and development has rewarded us with a sophisticated software solution like X-Analysis, built to meet the requirements of advanced computing and analysis. Today, we are at that exciting phase from where we can look forward to being more progressive and introduce futuristic Re-engineering or Re-architecting tools and solutions. The X-Redo module is one such innovate.

As we know, X-Analysis dissects legacy application programs to decouple screens from embedded business logic. This componentization can be leveraged by the X-Redo module to generate JSFs, JavaBeans and ORM objects, thereby assisting in Re-architecting a legacy application in J2EE.

Having seen the X-Analysis solution set in action, you are now equipped to get on with the application redevelopment.

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Appendix A – Enabling the SEU Interface

Create User Profile XAN4SEU

When browsing source code using the AS400 SEU, it is necessary to be logged in as user XAN4SEU. The following gives instructions for creating the correct user profile.

Step 1 Logon as **QSECOFR**.
Step 2 Create user profile **XAN4SEU**.

Use the ***CRTUSRPRF*** command to create the user profile **XAN4SEU.** Make sure that the following parameters are set:

User Password : XAN4SEU
User Class : *PGMR
Initial Program : XSEUCLP
Library : XAOBJ

```
                        Create User Profile (CRTUSRPRF)


 Type choices, press Enter.

 User profile . . . . . > XAN4SEU       Name
 User password  . . . . .   *USRPRF      Name, *USRPRF, *NONE
 Set password to expired  . . . .   *NO  *NO, *YES
 Status . . . . . .   *ENABLED      *ENABLED, *DISABLED
 User class . . . . . > *PGMR       *USER, *SYSOPR, *PGMR...
 Assistance level . . . . . .   *SYSVAL      *SYSVAL, *BASIC, *INTERMED...
 Current library  . . . . . .   *CRTDFT      Name, *CRTDFT
 Initial program to call  . . . . > XSEUCLP      Name, *NONE
   Library  . . . . . >   XAOBJ        Name, *LIBL, *CURLIB
 Initial menu . . . . . .   MAIN          Name, *SIGNOFF
   Library  . . . . . .     *LIBL        Name, *LIBL, *CURLIB
 Limit capabilities . . . . . .   *NO      *NO, *PARTIAL, *YES
 Text 'description' . . . . . > 'X-Analysis - SEU User'

                                                                      More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Press F10 and Page Down

Set Special Authorities:

*ALLOBJ

*JOBCTL

*SAVSYS

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```
                    Change User Profile (CHGUSRPRF)

Type choices, press Enter.

                            Additional Parameters

Special authority  . . . . . .   *ALLOBJ       *SAME, *USRCLS, *NONE...
                                  *JOBCTL
                                  *SAVSYS
Special environment  . . . . . .  *SYSVAL       *SAME, *SYSVAL, *NONE, *S36
Display sign-on information  . .  *SYSVAL       *SAME, *NO, *YES, *SYSVAL
Password expiration interval . .  *SYSVAL       1-366, *SAME, *SYSVAL, *NOMAX
Limit device sessions  . . . . .  *SYSVAL       *SAME, *NO, *YES, *SYSVAL
Keyboard buffering . . . . . .    *SYSVAL       *SAME, *SYSVAL, *NO...
Maximum allowed storage  . . . .  *NOMAX         Kilobytes, *NOMAX
Highest schedule priority  . . .  3             0-9
Job description  . . . . . .     QDFTJOBD      Name
  Library  . . . . . .              QGPL        Name, *LIBL, *CURLIB
Group profile  . . . . . .        *NONE         Name, *NONE

                                                                      More...
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Step 3 Logoff

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Appendix B - License Code Request Form

Databorough
Producers of X-Analysis

License Code Request Form

Kindly complete and confirm the details below and fax this form to: +44 **1932 859211**
Alternatively, this can be emailed to admin@databorough.com

Company	
Contact name	
Contact email	
Telephone	
Fax	
Address	
Post Code	
Country	
AS/400 Serial No.	
Model	
Processor Group **(WRKLICINF)**	
Agent or Distributor	
Comments	

If software is required to be sent and the AS/400 is not located at the same address as indicated above please provide the appropriate delivery address and contact details below.

AS/400 Contact			
Contact email			
Telephone			
AS/400 Address			
Post Code		Country	

Requested By _____ Date _____

Position _____

Unit 12b, Weybridge Centre, 66 York Road, Weybridge, KT13 9DY, United Kingdom Tel: +44 (0) 1932 848564
Company Registration Number: 01795263 VAT number: 492 6942 05

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